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(71) Applicant and
(72) Inventor: **SEDRAN, Ezio** [IT/IT]; Via Col Alto, 3, I-33077 Sacile (IT).

(74) Agent: **BENETTIN, Maurizio**; Via Sorio, 116, I-35141 Padova (IT).

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(54) Title: MODULAR ELEMENTS FOR FORMWORKS

(57) Abstract: The invention is a new system of formworks for concrete casting, comprising various elements connected to one another for the construction of any building structure in concrete, such as foundations, plinths, reversed beams, straight and curved walls, pillars, floors, beams having the same thickness as the floor, short beams and cantilevers. These elements comprise a single-piece panel made of a plastic material (thermoformed polymers), practically smooth on one side and provided with edge ribs along the four sides on the other side, said ribs being provided with holes and/or slots for the connection with adjacent modular elements, said single-piece panel being also provided with ribs for connecting said edge ribs, as well as pins and centering cones, connection wedges, angle sections, load distribution crosses, trapezium-shaped supports, flat bars with plane connection elements, locking blocks, cross support, extractor.

TITLE

MODULAR ELEMENTS FOR FORMWORKS

DESCRIPTION

The present invention concerns building equipment and in particular it concerns a new set of modular elements that, when assembled by means of the appropriate accessories, make up formworks suitable for the construction of concrete structural elements.

At present modular formworks are available, which comprise a metal structure (steel or aluminium) that serves to counteract the thrust exerted by concrete; a plane panel, in most cases made of plywood and having the function to contain and give shape to concrete is fixed to this metal structure by means of screws and/or rivets.

The metal structure is constituted by section bars with constant section welded to one another, the shape and thickness of which are selected according to the maximum stress (thrust exerted by concrete) to which the modular element comprising the formwork is subjected. Therefore, in all the points in which the force exerted is lower, the quantity of material present in the section bars used is excessive, with the negative consequence that the total weight of the modular element is too high, as well as its cost. It is just the excessive weight that makes it impossible to use this type of formworks for the construction of horizontal structures, and furthermore due to their high cost small companies cannot even afford to buy them. Finally, it is important to take in consideration also the accessories required for the assembly and use of this type of formworks, in fact most of them are made of steel and/or cast

iron and this further increases either the weight and the cost of the elements used.

The plane panel is mainly constituted by several layers of wood glued to one another, whose terminal surfaces are covered with phenolic resins, in order to protect them from the action of water. Nevertheless, water corrodes them until they rot, either because the panel edges are not protected and because their use in building sites causes abrasions in the phenolic resins, through which plenty of water can easily penetrate.

It is to eliminate the drawbacks mentioned above that a new set of modular elements has been designed and implemented for the construction of formworks in thermoformed materials (thermoplastic polymers) with the thermoinjection technique, that is, through the injection of molten thermoformed polymers into a metal mould.

These innovative formworks differ from those used at present mainly for the following characteristics:

- universality, that is, the possibility of constructing any type of vertical and/or horizontal structure, like foundations, plinths, reversed beams, rectilinear and/or curved walls, floors, short beams, beams having the same thickness as the floor, cantilevers and pillars;
- lightness, since the materials used, which at present are not utilized for the construction of formworks, are characterized by low specific weight and the production technique, that is, the injection of thermoformed polymers (polyamides, etc.) into a steel mould makes it possible to use the quantity of material that is sufficient and necessary to counteract the forces to which the formworks are subjected, forces that vary considerably in the different points of the formworks and

depending on their different applications; furthermore, the low weight of the element with the largest size (less than 33 kg) allows the formwork to be manually used by one person only, in full compliance with the latest standards, and also allows it to be used for floors and other horizontal building structures, while for its construction the modular elements must be manually lifted to the height of the structure to be built, before and after its construction;

- low cost, since the material used and the production technique make it possible to considerably reduce production costs and, consequently, selling prices, with the positive result that these formworks can be purchased even by small companies that today cannot afford to buy this equipment since its high cost and limited use do not permit depreciation;
- easy disposal thanks to the fact that the material is recyclable, in fact thermoformed polymers can be recycled easily and at low cost through trituration and/or thermal recovery technique;
- long life, since the material used is not affected by the corroding action of water and cannot be chemically attacked by concrete.

The object of the invention is the implementation of an optimal formwork system, provided with stiffening and coupling elements obtained in a single unit with the plane structure itself. Practically, the invention concerns single-piece elements obtained by means of plastic moulding, whose accessories (pins, wedges, coupling and fastening elements, etc.) are preferably produced with the same techniques and the same material, if necessary reinforced with fibres, with the

consequence that the advantages described above are extended to the entire system.

Another aim of the invention is the implementation of elements that can be easily recycled and disposed of through trituration or thermal recovery.

A further goal is the construction of lighter elements compared to those presently used for formworks, with maximum weights considerably lower than 33 kg, which therefore can be easily handled even by one person only.

Another goal is the construction of elements having the same weight but larger size compared to those presently available on the market, with evident savings in laying times.

Another aim is the implementation of elements to which, if necessary, it is possible to fix wooden elements by means of rivets.

A further aim of the invention is the implementation of a versatile system that can be used in all building applications: plinths, foundations, walls, pillars, circular walls, floors, beams having the same thickness as the floor and/or short beams, etc.

The single-piece element is preferably made of a single material, or if necessary of two different materials, for example nylon (polyamide) for the ribbing and the structure and polyethylene for the plane part, still remaining a single piece, which is due to the application of the thermoforming technique.

The new modular elements for formworks for concrete casting mainly comprise a panel in thermoformed plastic material, preferably polypropylene, with ribbing either along the four edges and across the panel width. In particular, the ribs along the edges are provided with holes for the connection with the adjacent modular elements and slots and/or depressions that

make it possible to use a lever to detach the formworks from concrete, which otherwise would be difficult due to the suction effect resulting from the process.

It is possible to lighten and stiffen the modular element through the insertion of metal and/or fibre cores, through the production of cavities with the injection of gas, through the creation of cavities filled with foamed polymers and finally through the incorporation, obtained with appropriate couplings, of one or more removable metal structures, so that the single-piece modular element may always be easily recycled and disposed of.

The new set of modular elements makes it possible to quickly construct formworks, even with irregular shape (connection angles different from 90°), and can be easily and quickly assembled and disassembled.

Said single-piece elements and the relevant accessories can be even made in different colours or partly different, even fluorescent colours.

The difference in colour, which today cannot be achieved with any other system, except for very expensive systems with limited duration, offers great advantages for the identification of the element class.

In fact, in common applications for the construction of formworks these elements can be subjected to different loads depending on their position, the intended use and the formwork filling speed (hydrostatic force). For this purpose the different colours can be used to identify the class to which the element belongs (capacity 40-60-80 KN/sqm). Furthermore, the capacity and other applicative technical data, such as the

concrete filling time/fluidity diagram, are impressed on the element due to the shape of the mould itself.

The following is the description of one among many possible applications of the new system for the construction of formworks and its main elements, illustrated in the enclosed drawings, wherein:

Figure 1 shows a rectangular modular panel (P) having smooth surface (Pl) on one side and ribs (Pnb, Pnl) on the other side, either along the four edges (Pnb) and across the panel (Pnl), wherein said ribs may have any suitable direction with respect to the edges themselves.

In particular, the ribs (Pnb) along the edges are provided with holes (Pf) for the connection with the adjacent modular elements. In particular, said panel is also provided with several slots (Pfb) positioned near the edge and with four depressions (Pfc) on the corners, within which a lever of the type commonly used in building sites can be easily inserted to facilitate the extraction of the panel from concrete, thus overcoming the suction effect.

The plane surface (Pl) is provided with holes (Pff) that serve to house a threaded bar for the purpose of counteracting the concrete thrust produced when the latter is cast into the formwork.

Figure 2 shows a rectangular modular panel where the ribs (Pnb, Pnl) are made with one type of material, for example nylon (polyamide), while the plane surface (Pl) is made with another type of material, for example polypropylene.

Figure 3 shows a rectangular modular panel – presented as one among many possible applications - provided with one or more

metal cores (Am) inserted in the ribs (Pnb, Pnl) and one or more fibre cores (Af) inserted in the plane side (Pl).

Figure 4 shows a rectangular modular panel – presented as one among many possible applications - provided with some cavities (Ca) designed to serve as structural lightening or stiffening elements and obtained through the injection of gas in the connection points between the ribs (Pnb, Pnl) and the plane side (Pl).

Figure 5 shows a rectangular modular panel where, by way of example, the ribs (Pnb, Pnl) are lightened and stiffened by cavities (Cs) filled with foamed polymers.

Figure 6 shows a rectangular modular panel where, by way of example, the ribs (Pnl) are stiffened and strengthened by a metal structure (Sm) that is incorporated and held by means of easily removable couplings (Pag), so that it can be easily removed and the panel maintains the features that make it easy to recycle and/or dispose of.

The example illustrated in the figure does not exclude the possibility of extending this technique also to the perimetric ribs (Pnb).

Figure 7 shows a centering cone (C), two pins (U) and one wedge (I) to be used to join and align several modular panels (P), preferably made with the same materials and construction techniques.

The pins (U) are elements having cylindrical body (Uc), large and flat head (Ut) and a tapered part (Uv) between head (Ut) and body (Uc). The cylindrical body (Uc) of said pins (U) is provided with longitudinal rectangular slots (Uf).

The pins (U) constituted as described above are suitable for being introduced in the holes (Pf) of the adjacent edge ribs (Pnb) of contiguous panels (P).

The inner diameter and the taper of the centering cones (C) are such as to permit their insertion in the pins (U) applied between two modular panels (P) from the side opposite their head (Ut) and to allow the tapered part to rest against the hole (Pf) of the edge rib (Pnb) of the panel (P).

The wedge (I) is a generically flat, trapezium-shaped element, suitable for being inserted in the slots (Uf) of the pins (U), so that they do not come off the centering cones (C) and the edge ribs (Pnb) of the panels (P).

Figure 8 shows an angle section (A) for right-angled connections and a hinged angle section (V) for non-right-angled connections, preferably made with the same materials and construction techniques.

The angle section (A) that joins and connects various modular panels (P) at right angles comprises a square section, solid and/or hollow standard (Am), provided on two contiguous sides with pins (Ap) arranged orthogonally with respect to the side of the standard (Am). Said pins (Ap) of the standards (Am) have the same features, except for the head, as the above mentioned pins (U). Said angle section (A) can be used to make either internal angles and external angles, according to the direction in which the panels (P) are fixed. A further, essentially parallelepiped-shaped element (Au) is also provided, which is suitable for being inserted in the hollow head of said angle section (A), in such a way that it acts as connection element between two superimposed angle sections (A).

The angle section (V) that joins and connects various modular panels (P) comprises two strips (Vb) hinged to each other on their longer sides. Each one of the two strips (Vb) is provided with pins (Vp) that are arranged orthogonally with respect to the strips (Vb) and have the same features as the above mentioned pins (U), except for the head.

Figure 9 shows a load distribution cross (Y), comprising a cross-shaped body (Yc), ribs (Yn, Yp), a hole (Yf), a depression (Yr) and a housing (Ys).

Figure 10 shows an example of assembly of some of the above mentioned modular elements to be used in a formwork for the construction of a concrete wall. In this example the following components are used: panels (P) with varying dimensions, 90° angle sections (Ai, Ae), pins (U), centering cones (C), fastening wedges (I) and other known elements. It can be clearly observed that the angle sections (A) may be used indifferently for internal (Ai) and external angles (Ae).

The same table shows the load distribution cross (Y) positioned at the joint of the panels (P), so that its hole (Yf) coincides with the hole (Pff) present in the panel. A threaded metal bar (commonly used in the formworks presently available on the market) is inserted in these holes, in order to counteract the thrusting force of the concrete cast in the formwork. The load distribution cross (Y) serves to align adjacent panels (P), to maintain the linearity of the ribs (Pnb, Pnl) subjected to the thrusting force exerted by the cast concrete and to distribute the compression force resulting for said thrust.

Figure 11 shows a triple-purpose block (ZT), a sliding block (ZS), a flat bar with holes (B) and a pin (H), preferably made with the same materials and construction techniques.

The triple-purpose block (ZT) comprises a parallelepiped-shaped element provided with a hook projection (ZTg) on one side, with a hole (Zte) and with through slots (ZTf) on the various sides. The hook projection (ZTg) is suitable for joining the block (ZT) with the ribs (Pnb) present on the panels (P), while the hole (Zte) houses the pin (H) and the through slots (ZTf) house the bars with holes (B).

The sliding block (ZS) comprises a parallelepiped-shaped element provided with a hook projection (ZSg) on one side, with a hole (Zse) and a slot (ZSf) orthogonal with respect to one another. The hook projection (ZSg) is suitable for joining the block (ZS) with the ribs (Pnb) present on the panels (P), while the hole (ZSe) houses the pin (H) and the through slot (ZSf) houses the bar with holes (B).

Figure 12 shows said panels (P) with two linear elements (T) with trapezium-shaped section, said linear elements being interposed and positioned so that they are adjacent to each other along the inclined side. These elements (T) are provided with through holes (Tf) coinciding with the holes (Tf) of the opposed element (T), wherein a locking pin (Pp) is inserted in said holes (Tf). Said linear elements (T) with trapezium-shaped section are particularly useful in the form stripping phase, when they are released from each other by extracting the through pin (Pp). In any case, these elements ensure comfortable form stripping operations even in difficult situations, for example in the restricted space of a lift well.

The detail, illustrated in the same figure, shows that the space left free by the linear elements (T) after their extraction is sufficient to allow the panel (P) to be detached from the angle section (A) through the rotation of the panel (P) itself.

Figure 13 shows a cross support (X) for the construction of floors, beams having the same thickness as the floor, short beams, shelves, etc., preferably made with the same materials and the same construction techniques, comprising a parallelepiped-shaped element (Xc) provided with two cuts (Xi) orthogonal to each other and suitable for housing the ribs (Pnb, Pnl) of one, two, three or four modular panels (P). The lower surface is provided with a cylindrical pin (Xb) and with holes (Xa) that permit the coupling with the upper plate of the traditional metal props commonly used in building sites. In particular, the pin (Xb) fits into the hole at the centre of the prop plate, while the holes (Xa) allow the support (X) to be fastened to the prop plate by means of a self-threading screw.

The figure shows also a plane connection element (M) for bars with holes (B), comprising two plane parts (Mp) joined by a transversal part (Mt), with dimensions and distances suitable for housing the ends of two bars with holes (B) that are anchored to the plane connection element (M) by inserting the pin (H) in the corresponding holes. The plane connection element (M) serves to extend the length of the bars with holes (B).

Figure 14 illustrates an example of use of panels (P), blocks (ZT), bars (B) and pins (H), where it is possible to observe that the blocks (ZT) and the bars (B) can be easily adapted to specific types of assembly and different combinations.

Figures 15 and 16 show five construction examples of modular panels (P) having different ribbing (Pnb, Pnl), either along their four edges (Pnb) and on the panel (Pnl). These figures point out one of the characteristics distinguishing these modular elements from those used at present, that is, the opportunity to

construct modular elements distributing the material in the points subjected to most stress, instead of welding metal bars with constant section.

Figure 17 shows a right-angled positioning bracket (S), preferably made with the same materials and construction techniques, provided with a through hole (Sf) and suitable for being applied to the modular panels (P) by means of the pin (Sp), in order to keep them perfectly orthogonal to each other and to counteract the thrusting force of concrete, for example when making the perimeters of floors and/or beam and slab rafts. Furthermore, the lateral edges are provided with several holes (Sb) that allow the positioning bracket (S) to be fixed to the support surface through riveting.

An example of application of the positioning bracket (S) is provided in the same figure.

Figure 18 shows an extractor (E) for the wedges (I), preferably made with the same materials and construction techniques, comprising a rod (Ea) at whose ends there are a flat head (Et) and a C-section head (Ec) suitable for coupling with the flat head of the wedges (I). Around the rod (Ea) of the extractor there is a sliding cylindrical element (Em) with appropriate weight, even made of metal.

The same figure shows the use of the extractor (E), whose C-shaped head (Ec) is coupled to the head of the wedge (I) to be extracted, while successively the sliding element (Em) slides on the rod (Ea) of the extractor (E) thanks to the repeated percussion of the flat head (Et) of the extractor (E) itself.

Table 19 shows some examples of modular panels (P) whose surface (Pl) opposite the ribs (Pnb, Pnl) is processed in such a way as to reproduce, for example, the grain of wood.

Table 20 illustrates the concrete reinforcement of foundations, short beams, shelves, etc., comprising spaced panels (P) that may be even positioned at non-modular distance, and wherein the difference is compensated for by an appropriate plane element, preferably made with the same materials and construction techniques, with folded edge (L). In this example the thrusting force exerted by concrete is counteracted, at the base, by blocks (K) fixed to the support surface with rivets passing through the holes (Kf), said blocks holding the support edge of the panel (P) through the head (Kt), while at the top the thrusting force is counteracted by the bars with holes (B) fixed to the sliding blocks (Zs) with the pin (H). The coupling of the sliding blocks (Zs) with the panel (P) takes place through the hook projection (ZSg) of the sliding blocks (ZS), which fits into the ribs (Pnb) of the panel (P) and holds them. The lower part of the base block (K) is provided with some depressed sections (Kr) into which a lever is inserted to detach the block from the surface to which it was fixed.

Table 21 shows an example of pillar reinforcement, carried out using the same angle sections (A) used for the construction of formworks for masonry applications, said angle sections being coupled to panels (P) fixed to one another by means of pins (U), centering cones (C) and wedges (I).

Table 22 shows another example of formwork for the construction of floors, short beams, beams having the same thickness as the floor, etc., in particular it shows how the cross support (X) is fixed to the plate (Qt) of the props (Q) commonly used in building sites, that is, by fitting screws into the holes (Xa) of the cross support (X); the figure also shows how the

cylindrical pin (Xb) fits into the hole (Qb) of the plate of the metal props (Q) commonly used in building sites.

Table 23 shows an example of application for the concrete reinforcement of foundation plinths. In particular, it shows how the bars with holes (B) can be lengthened as desired by using plane connection elements (M) and pins (H).

Table 24 shows an example of formwork carried out in a restricted space, where it is possible to observe the linear, trapezium section elements (T) sliding on inclined planes, which ensure comfortable form stripping operations even in difficult conditions.

Table 25 shows an example of concrete reinforcement of walls with angles different from 90° or circular walls, with hinged angle sections (V) coupled to the panels (P).

Table 26 shows a panel (Pi) provided with connection ribs arranged diagonally, a panel (Pii) provided with connection ribs arranged along curved and/or rectilinear lines of force and a panel (Piii) provided with ribs arranged in such a way as to form a square and with central holes for the connection to the opposite panel arranged in such a way as to form a cross.

Table 27 shows the panels (P) provided with coffers (Css) sustained by the cross support (X) positioned on the prop (Q) commonly used in building sites.

CLAIMS

1. Modular elements for the construction of formworks for casting concrete, characterized in that they comprise a single-piece panel made of a plastic material (thermoformed polymers), practically smooth on one side and provided with edge ribs along the four sides on the other side, said ribs being provided with holes and/or slots for the connection with adjacent modular elements, said single-piece panel being also provided with ribs for connecting said edge ribs.

2. Modular elements for the construction of formworks according to claim 1, characterized in that their edge ribs are provided with slots and/or depressions suitable for the insertion of a lever to facilitate the form stripping operations and in that they are provided with holes and slots for the connection to the opposite modular elements.

3. Modular elements for the construction of formworks according to claim 1, 2, characterized in that the ribs, for their whole length, have differentiated height and/or thickness.

4. Modular elements for the construction of formworks according to claim 1, 2, 3, characterized in that said ribs are different from one another due to their width and/or height.

5. Modular elements for the construction of formworks according to the previous claims, characterized in that said connection ribs are not positioned orthogonally with respect to the edge ribs.

6. Modular elements for the construction of formworks according to the previous claims, characterized in that said connection ribs are arranged on curved and/or straight isostatic lines of force.

7. Modular elements for the construction of formworks according to the previous claims, characterized in that they comprise one or more wide protrusions, commonly referred to as "coffers", to construct ribbed coffered ceilings

8. Modular elements for the construction of formworks according to the previous claims, characterized in that the surface adhering to the casting is processed in such a way as to reproduce the grain of wood.

9. Modular elements for the construction of formworks according to the previous claims, characterized in that they are provided with internal cavities, obtained through the gas injection technique, suitable for increasing their moment of inertia, stiffness and lightness and suitable for eliminating the effects of the suction of the material injected in the mould, which leads to irregularities and imperfections and causes the imperfect planarity and linearity of the final product.

10. Modular elements for the construction of formworks according to claim 8, characterized in that the cavities are filled with foamed polymers.

11. Modular elements for the construction of formworks according to the previous claims, characterized in that with appropriate couplings they can be integrated with one or more metal structures that are suitable for reinforcing their structure and at the same time may be easily released, so that the modular element may still be recycled.

12. Modular elements for the construction of formworks, characterized in that they comprise a plane element having a folded edge suitable for fitting between two near, but not adjacent modular panels.

13. Modular elements for the construction of formworks, characterized in that they comprise pins, centering cones and wedges for joining and aligning several modular panels, and wherein the pins have cylindrical body with rectangular slots, wide and flat head and a tapered part between head and body, and wherein the inner diameter and external taper of the centering cones are such as to permit their insertion in the pins applied between two modular panels and to allow the tapered part to rest against the hole of the panel edge rib, and wherein the wedge is a generically plane element in the shape of a trapezium, suitable for being inserted in the pin slots, so that they don't come off the centering cones and the panel edge ribs.

14. Modular elements for the construction of formworks, characterized in that they comprise an angle section for the right-angled connection of several modular panels, comprising a square section standard, preferably hollow, provided on two contiguous sides with pins arranged orthogonally with respect to the standard side, and wherein said pins of said standards have the same features, except for the head, as the pins described in claim 12.

15. Modular elements for the construction of formworks, characterized in that the side of the connection angle section is equal to the thickness of the modular panels, so that it can be used indifferently for convex and concave angles (internal and external).

16. Modular elements for the construction of formworks, characterized in that they comprise a connection element between two angle elements, the section of said connection

element corresponding to the cavity of said angle, so that they can be superimposed in perfect alignment.

17. Modular elements for the construction of formworks, characterized in that they comprise an angle section for joining and connecting several modular elements, constituted by two strips hinged to each other on their longer sides, each one of said strips being provided with pins, arranged orthogonally to the strips and having the same features, except for the head, as the pins described in claim 12.

18. Modular elements for the construction of formworks, characterized in that they comprise a load distribution cross constituted by a cross-shaped body, ribs, a hole, a depression and a housing, which, positioned in the joint between the modular elements in correspondence with the holes, aligns them, counteracts the thrusting force exerted by concrete and distributes the compression force.

19. Modular elements for the construction of formworks, characterized in that they comprise a linear element with section in the shape of a trapezium or right-angled triangle, provided with holes perpendicular to the length of the linear element, and wherein said linear element with section in the shape of a trapezium or right-angled triangle is suitable for being coupled to an identical corresponding element, so that both linear elements can be positioned between the panels of one of the formwork sides and the panels can be extracted from the pins of the angle sections.

20. Modular elements for the construction of formworks, characterized in that they comprise a flat bar provided with holes at regular intervals.

21. Modular elements for the construction of formworks, characterized in that they comprise a plane connection element for said flat bars with holes, said plane connection element being constituted by two flat parts connected by a transversal part, with dimensions and distances that allow the ends of two flat bars with holes to be housed therein.

22. Modular elements for the construction of formworks, characterized in that they comprise pins constituted by a cylindrical body with a rounded end and the other end provided with a flat head and a ring just below said flat head.

23. Modular elements for the construction of formworks, characterized in that they comprise a triple-purpose block constituted by a parallelepiped-shaped element provided with a hook projection on one side and with through slots and/or holes on the various sides, and wherein the hook projection is suitable for joining the block with the ribs of the panels described in the previous claims, and wherein the through slots and/or holes present on the various sides are suitable for the insertion of the bars with holes and of the pins described in claims 19 and 21.

24. 24. Modular elements for the construction of formworks, characterized in that they comprise a sliding block constituted by a parallelepiped-shaped element provided with a hook projection on one side and with through slots and/or holes on the various sides, and wherein the hook projection is suitable for joining the block with the ribs of the panels described in the previous claims, and wherein the through slots and/or holes present on the various sides are suitable for the insertion of the bar with holes and of the pin described in claims 19 and 21.

25. Modular elements for the construction of formworks, characterized in that they comprise a cross support for floors, shelves, etc., suitable for being applied to the top of the metal props commonly used in building sites, comprising a practically parallelepiped-shaped element provided with two cuts orthogonal to each other and suitable for housing the ribs of one, two, three or four modular panels, with a cylindrical pin in the lower surface and with holes that permit the fastening to the plate of the props mentioned above by means of self-threading screws.

26. Modular elements for the construction of formworks, characterized in that they comprise a right-angled positioning bracket provided with a through hole and suitable for being applied to the modular panels by means of a pin reaching beyond the holes present in the panel itself, in order to keep them perfectly orthogonal to each other and to counteract the thrusting force of concrete, as well as with holes on the lateral edges, which allow the positioning bracket to be fixed to the support plane with rivets.

27. Modular elements for the construction of formworks, characterized in that they comprise a base block constituted by a practically parallelepiped-shaped element provided with hook-shaped front head, through holes for the fastening to the support surface by means of rivets and with depressions in the lower part to facilitate the unriveting by means of levers.

28. Modular elements for the construction of formworks, characterized in that they comprise a wedge extractor constituted by a rod at whose ends there are a flat head and a C-section head suitable for coupling with the flat head of the wedges, and wherein around the rod of the extractor there is a

sliding cylindrical element that strikes the flat head of the extractor itself.

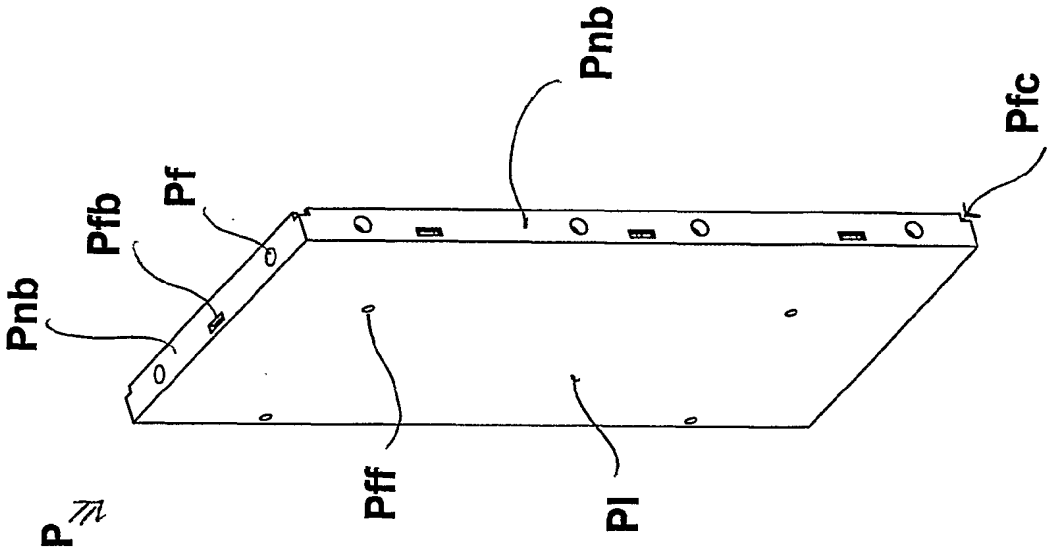
29. Modular elements for the construction of formworks according to the previous claims, characterized in that they are thermoformed with a single operation, through injection into a mould of two or more types of polymers and/or thermoformable synthetic materials in general.

30. Modular elements for the construction of formworks according to the previous claims, characterized in that they are provided with one or more metal reinforcement cores.

31. Modular elements for the construction of formworks according to the previous claims, characterized in that they are provided with one or more fibre reinforcement cores.

32. Modular elements for the construction of formworks according to the previous claims, characterized in that they are provided with one or more metal and fibre reinforcement cores.

33. System of formworks for concrete casting, characterized in that it comprises one or more elements, as claimed above, connected to one another for the construction of any building structure in concrete, such as foundations, plinths, reversed beams, straight and curved walls, pillars, floors, beams having the same thickness as the floor, short beams and cantilevers.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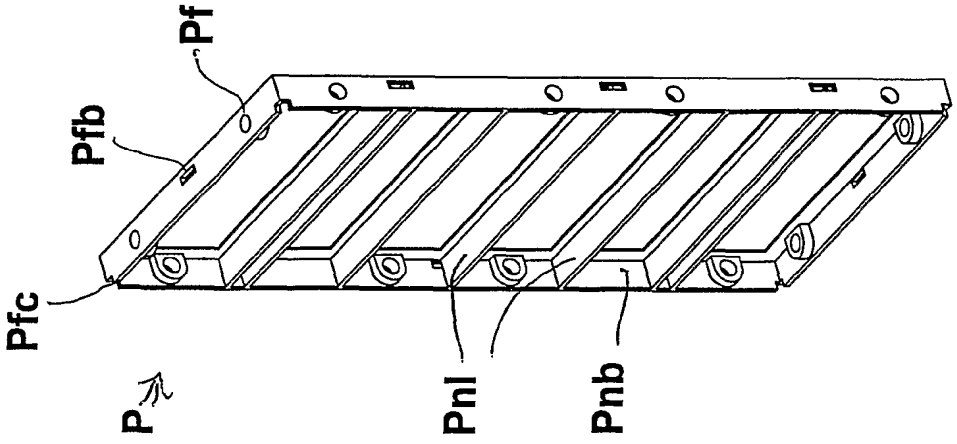
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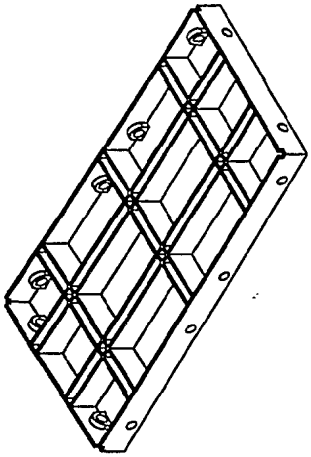

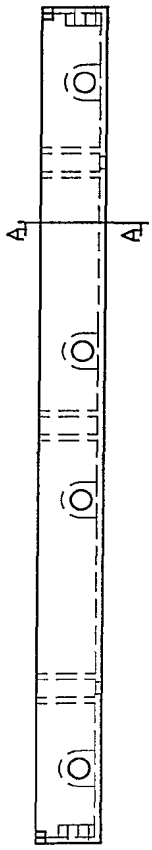
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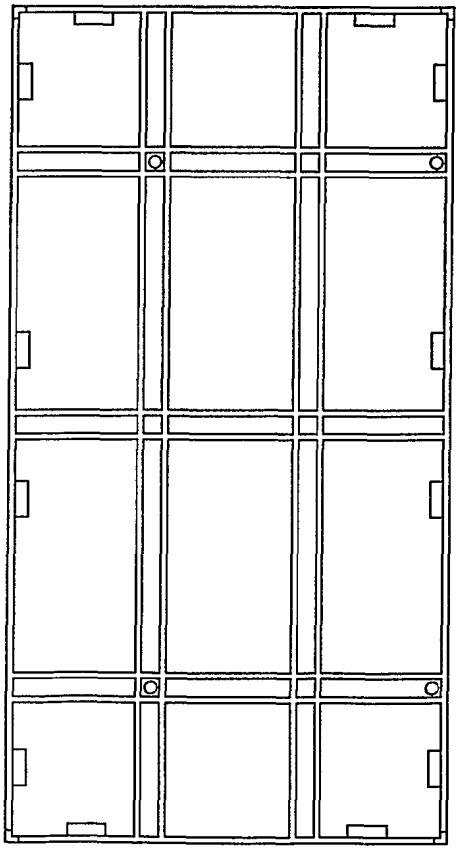

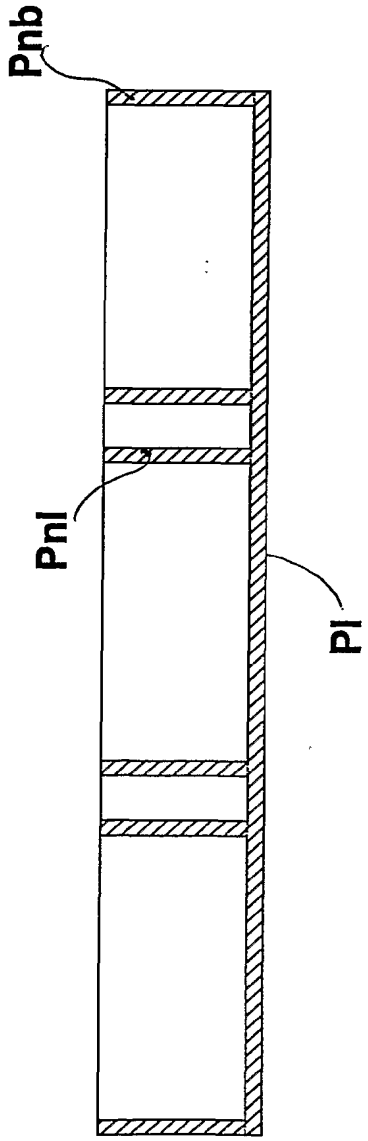
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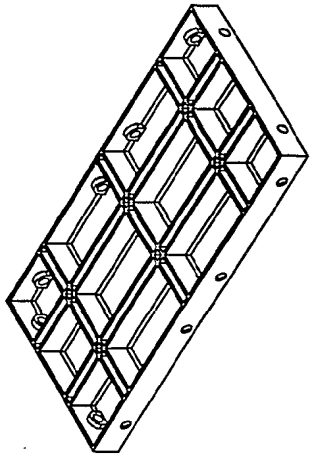

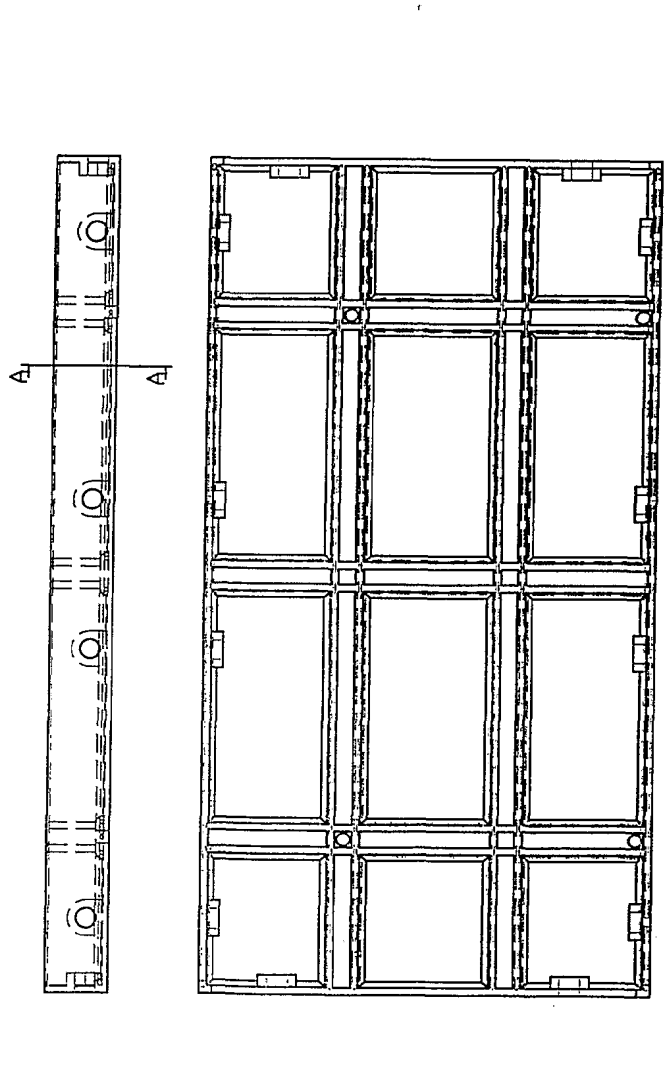
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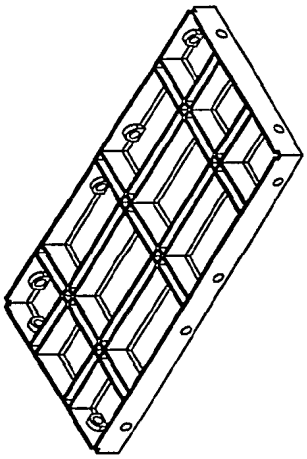

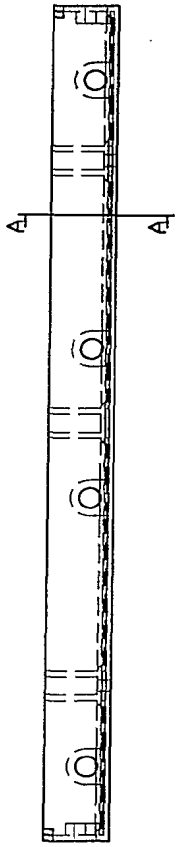
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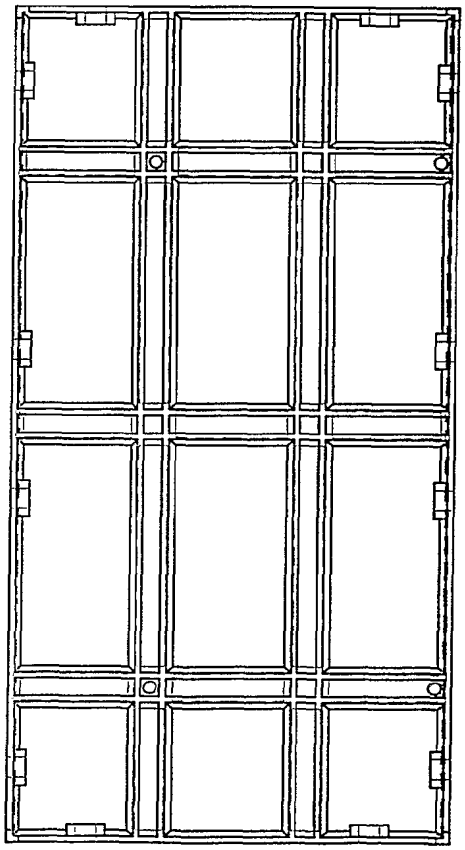

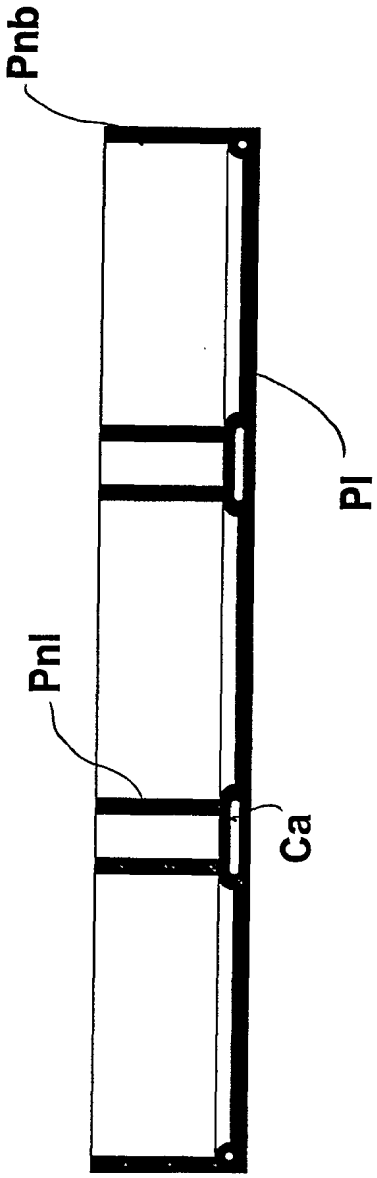
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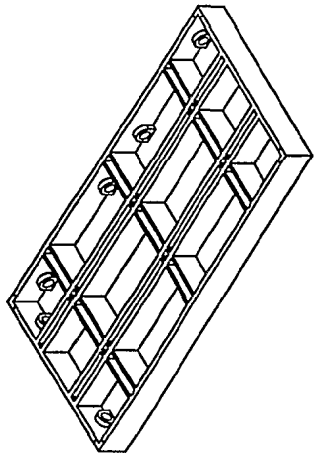

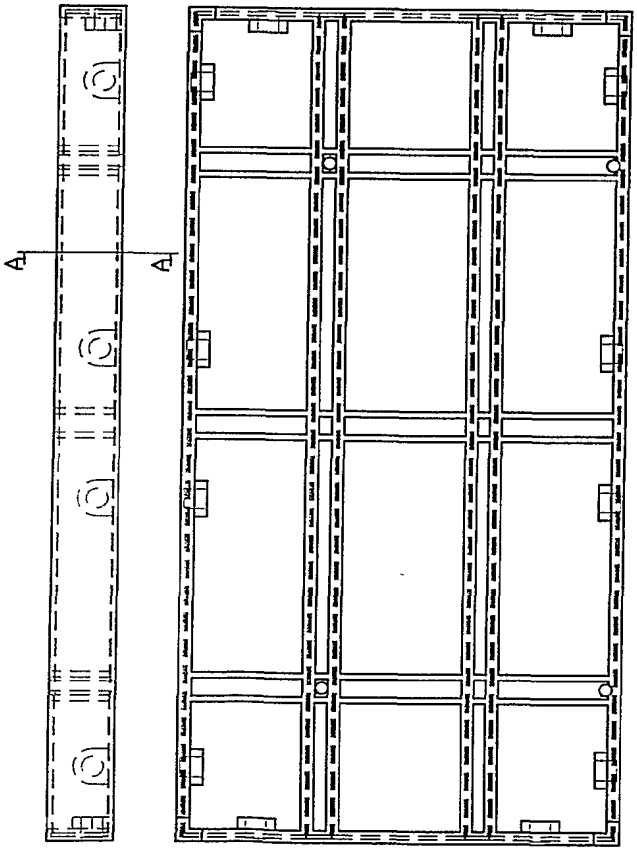
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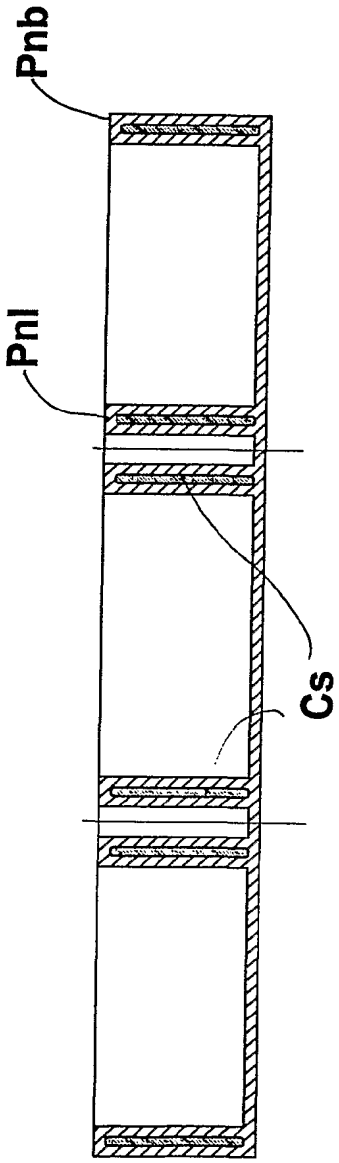
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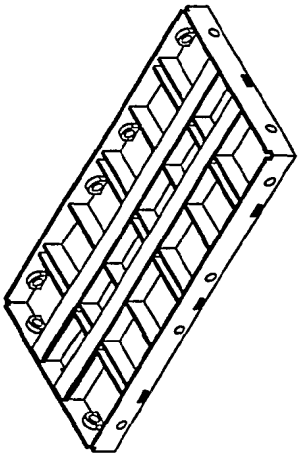

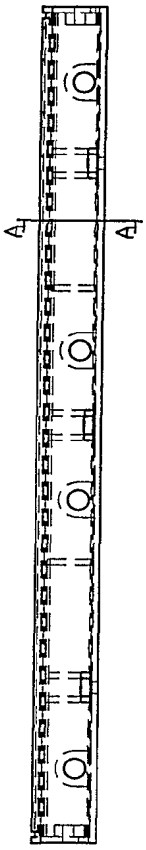
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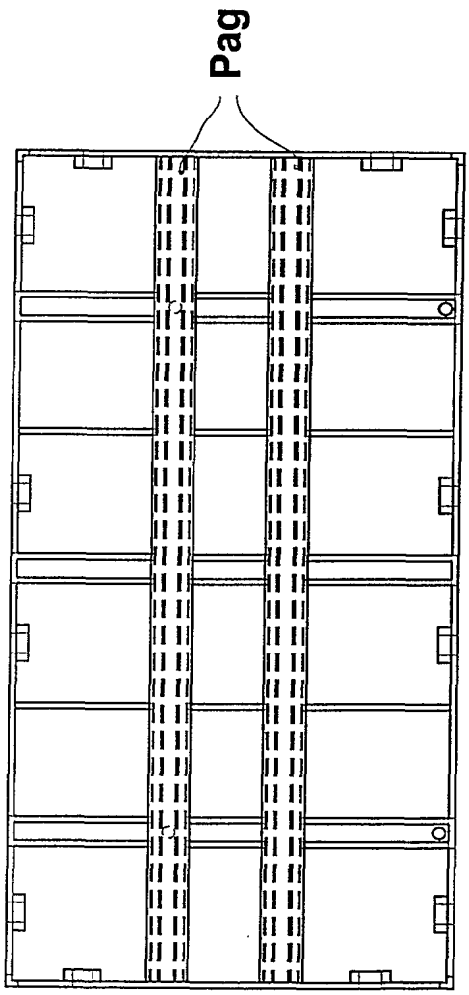
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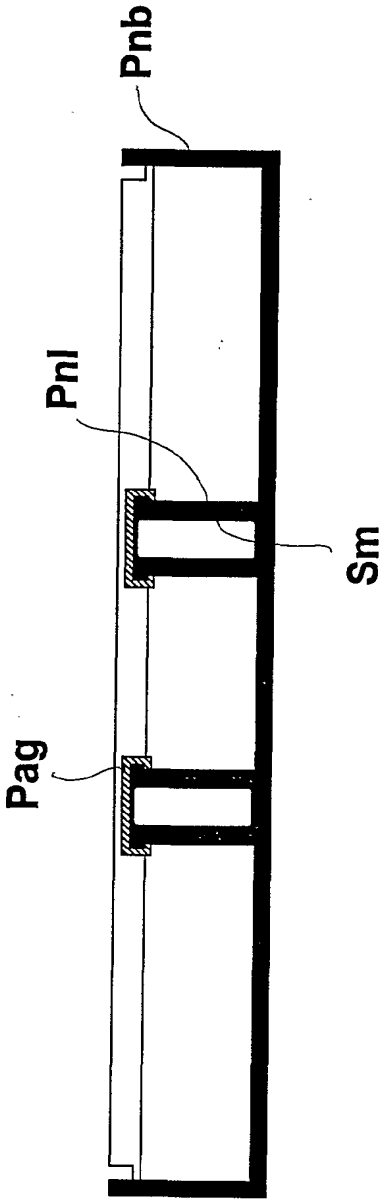
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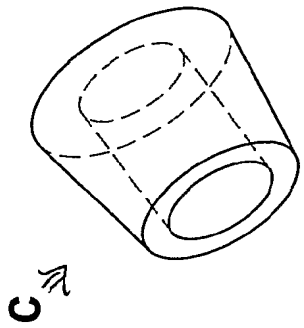
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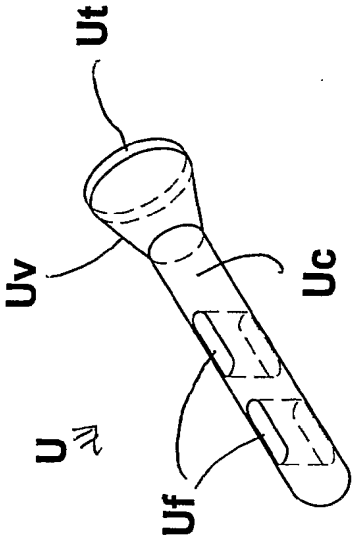
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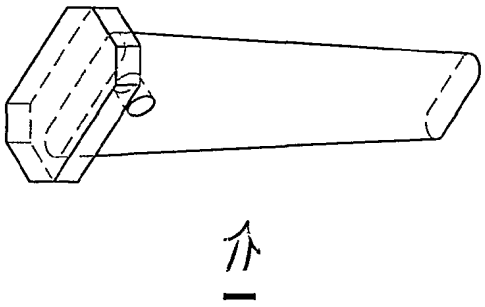
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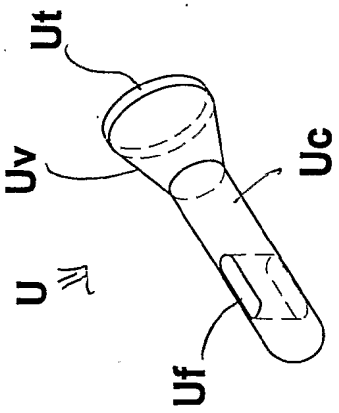
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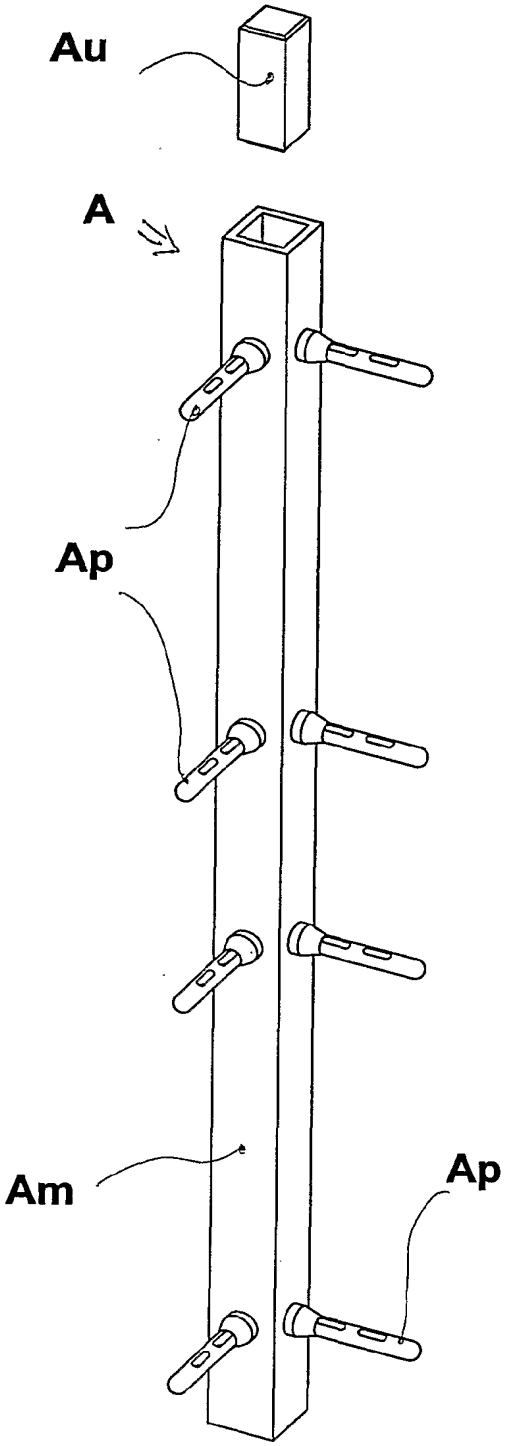
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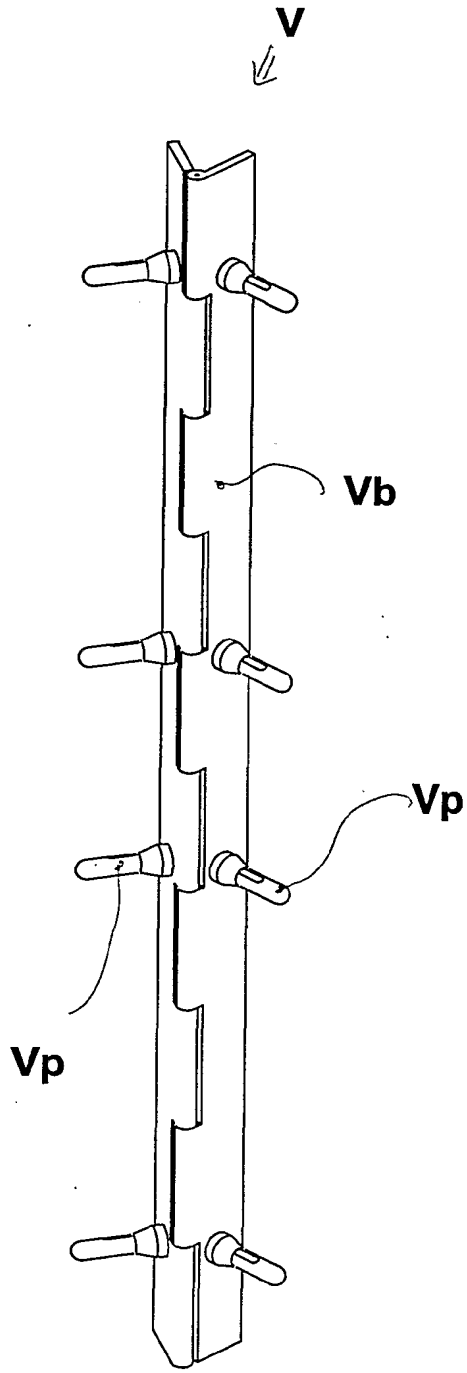
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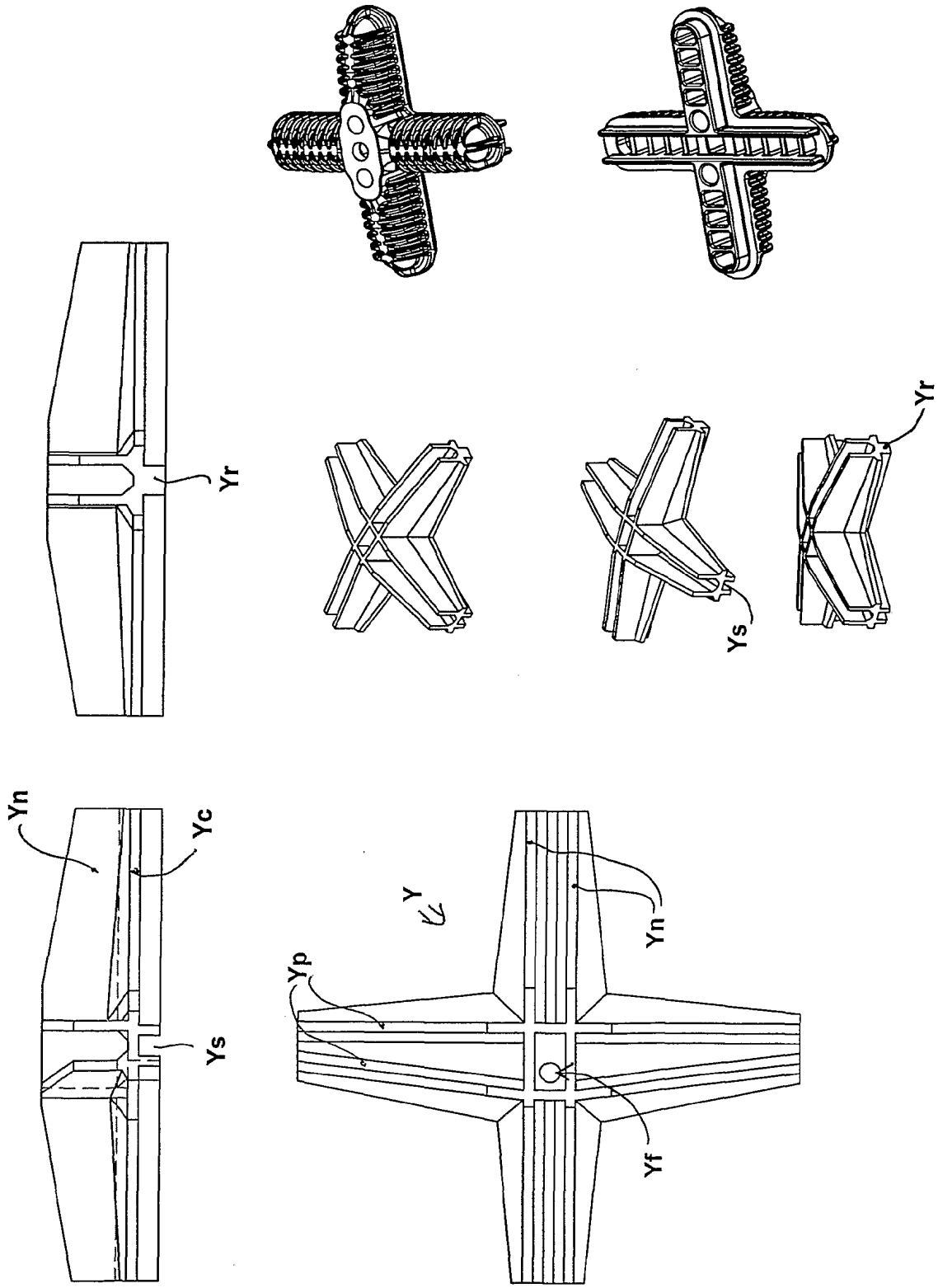
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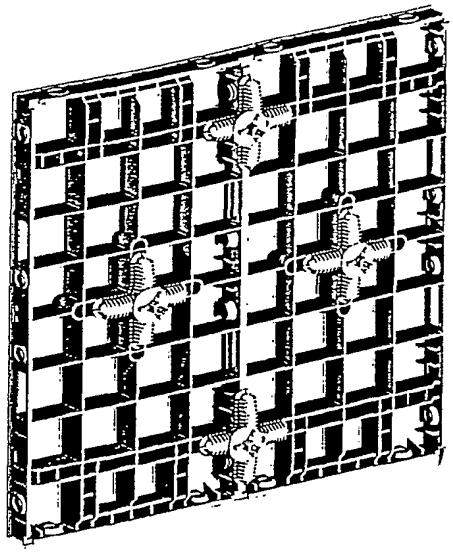

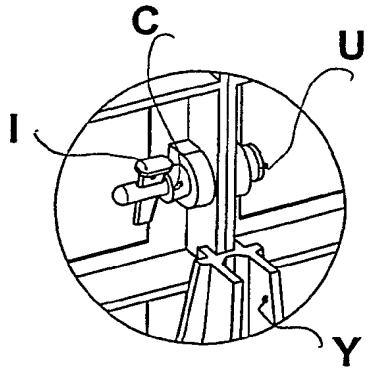
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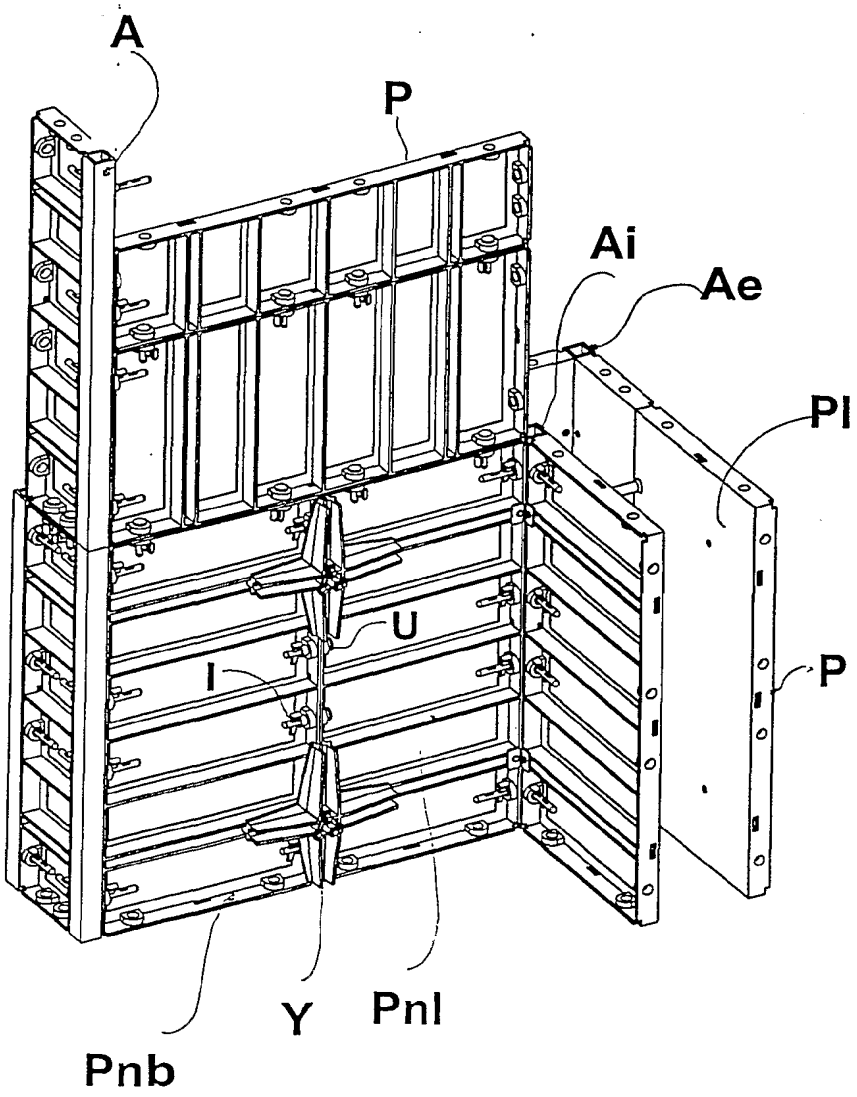
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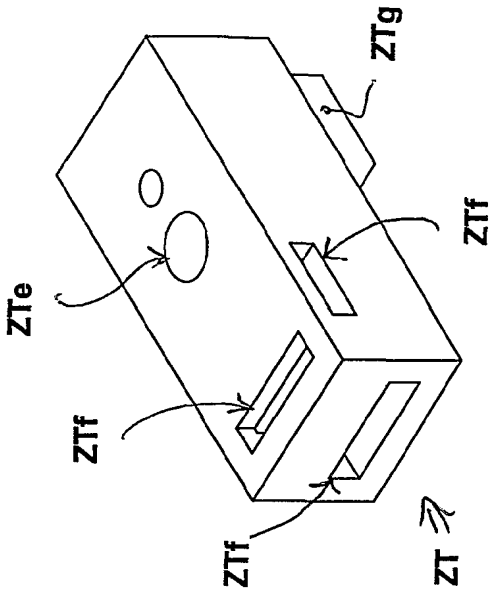

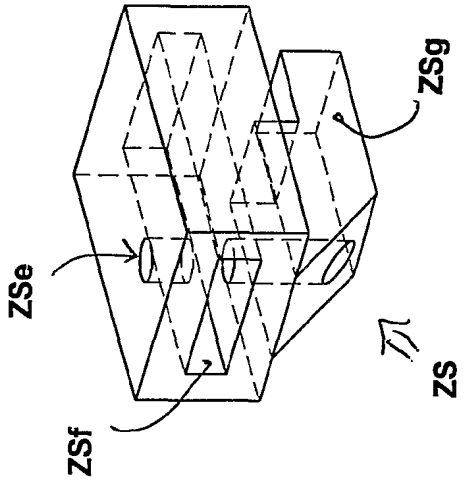

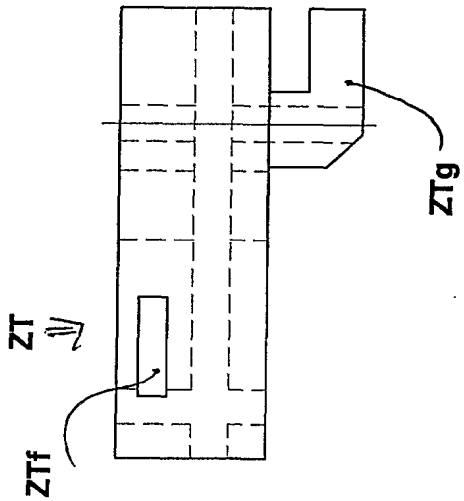

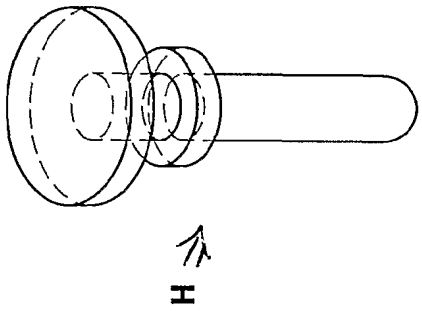

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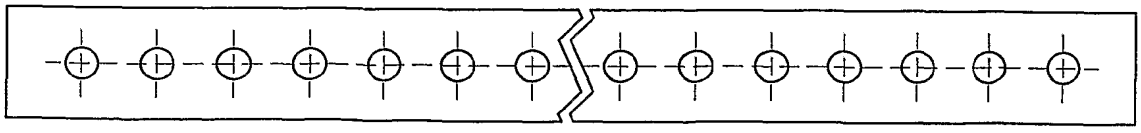

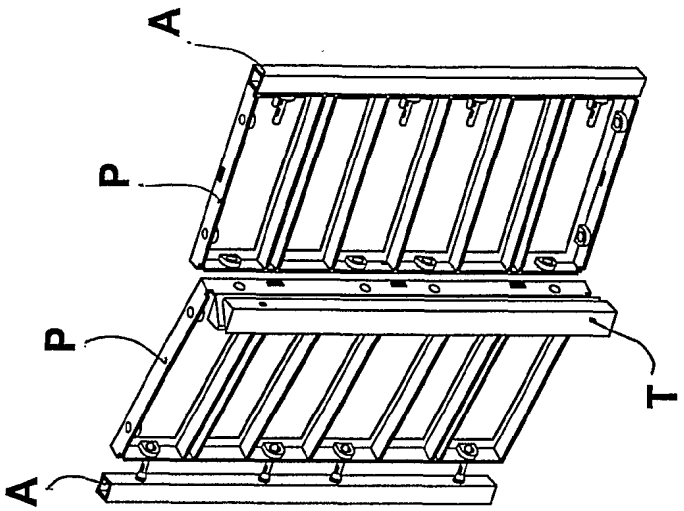
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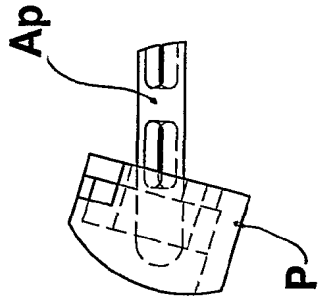
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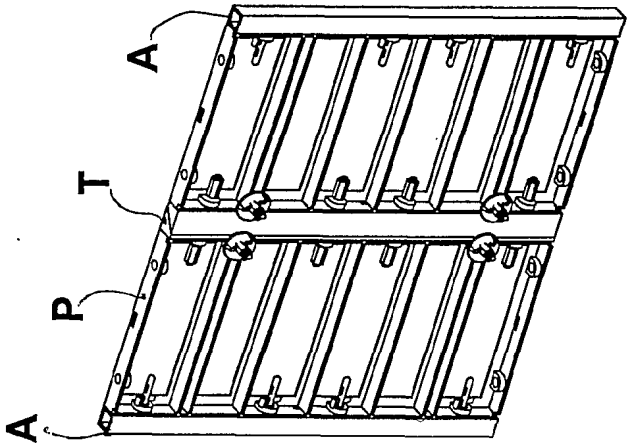
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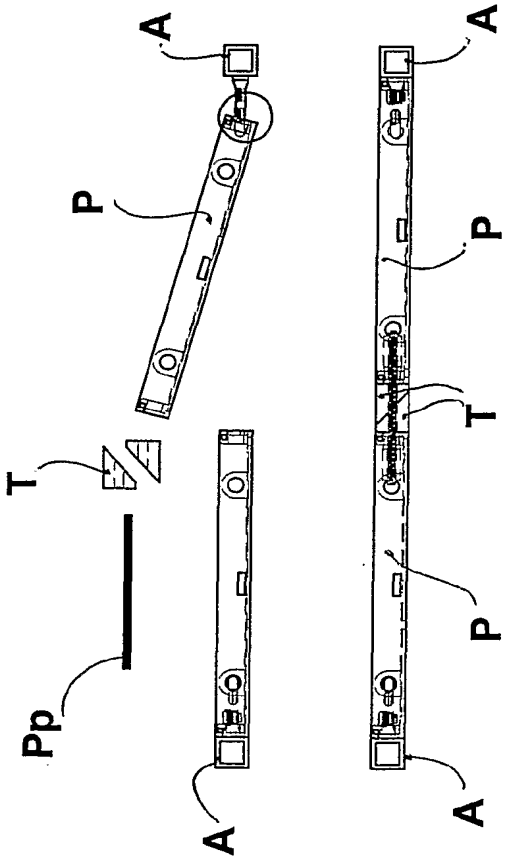
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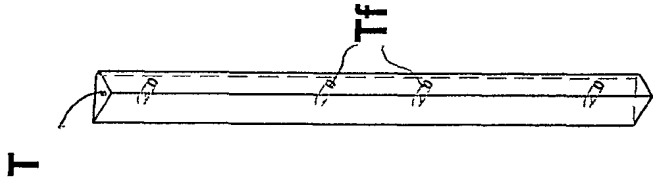
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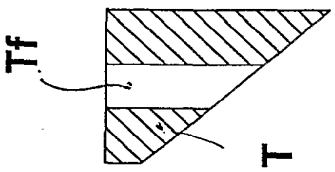
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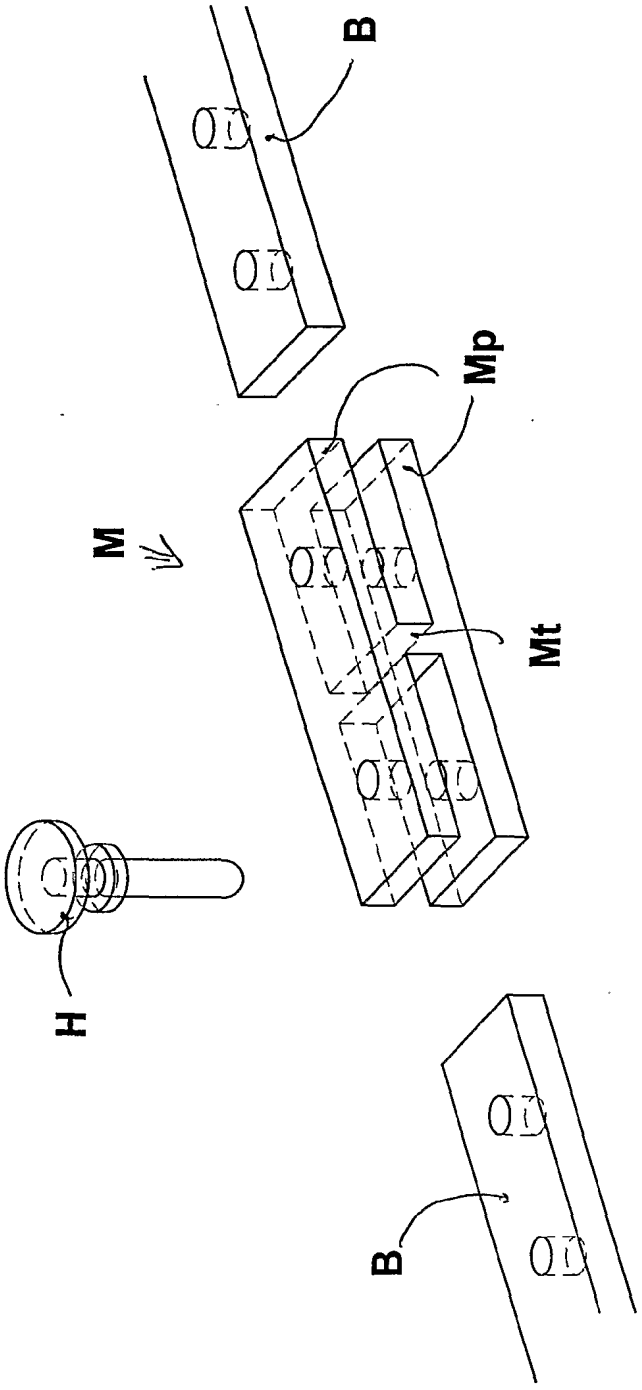
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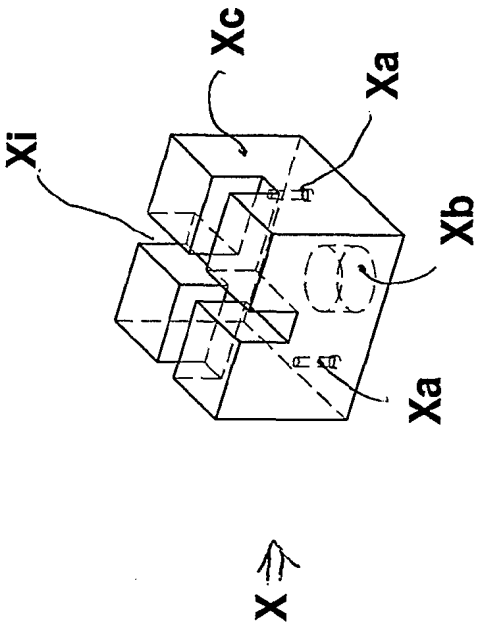
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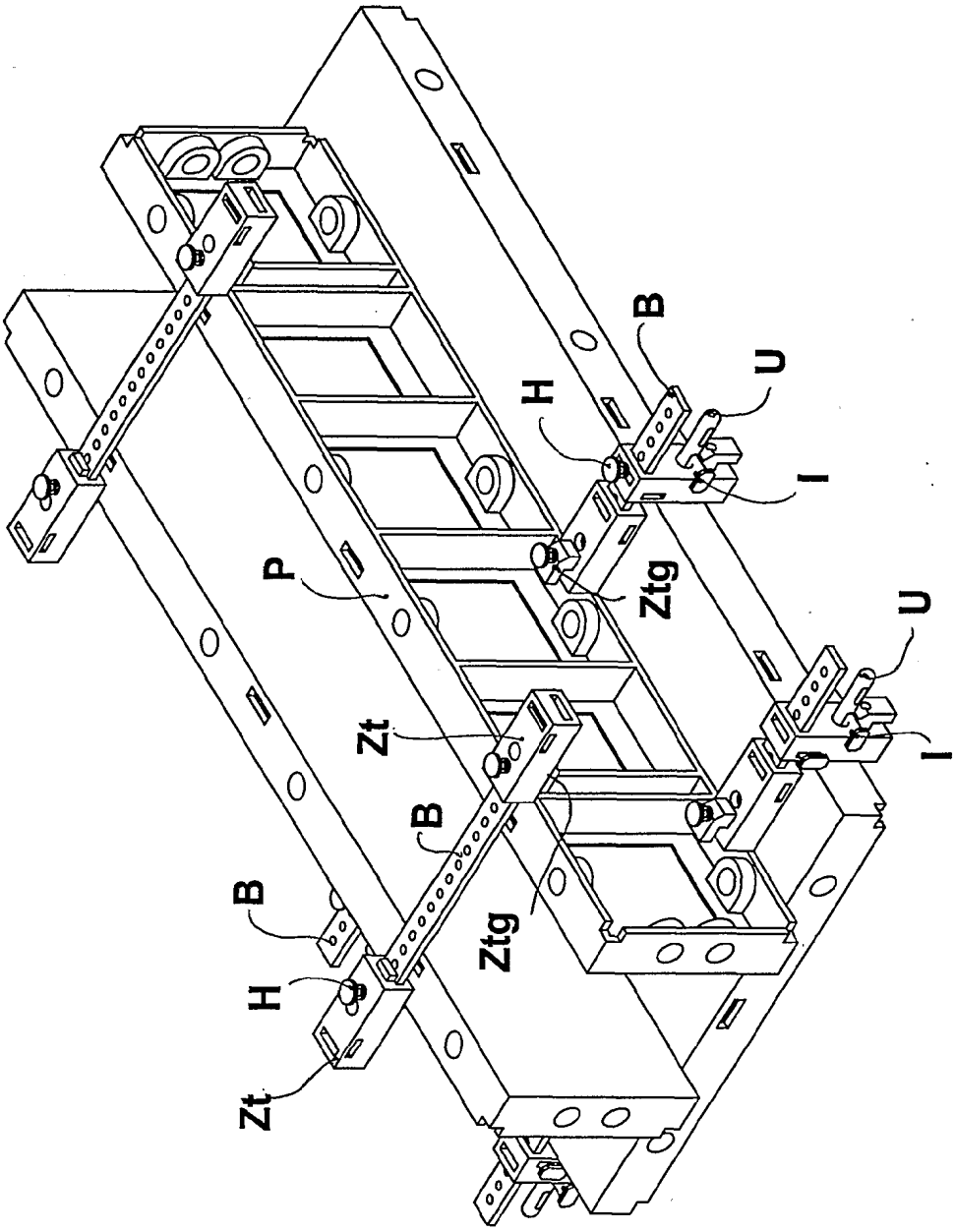
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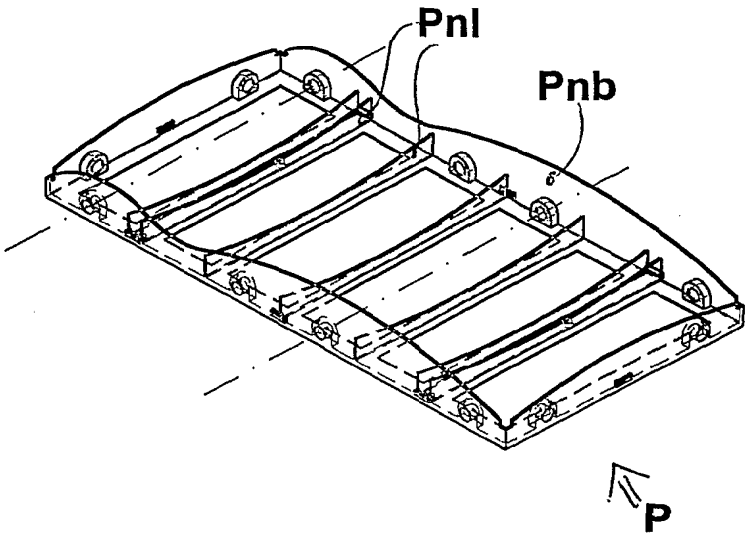
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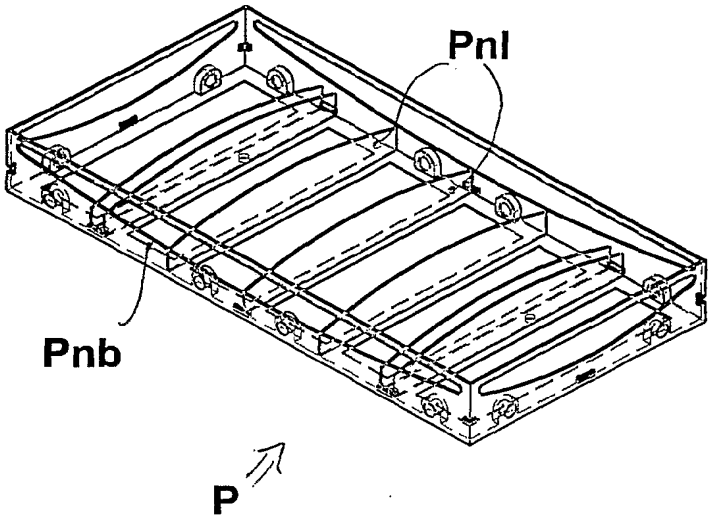
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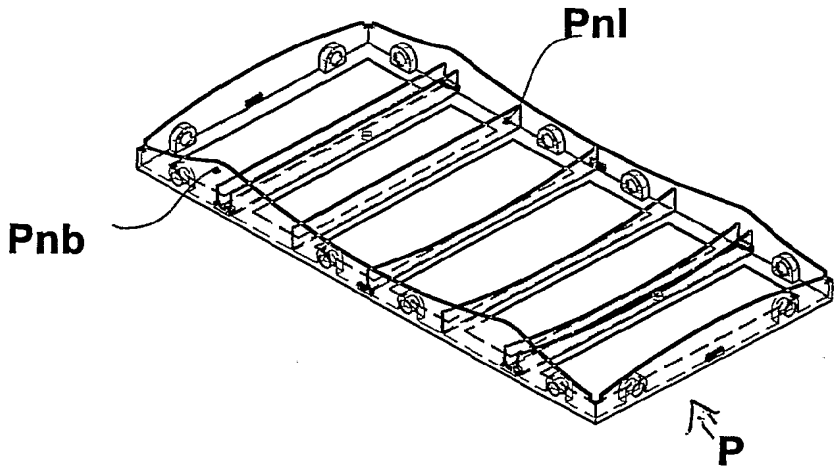
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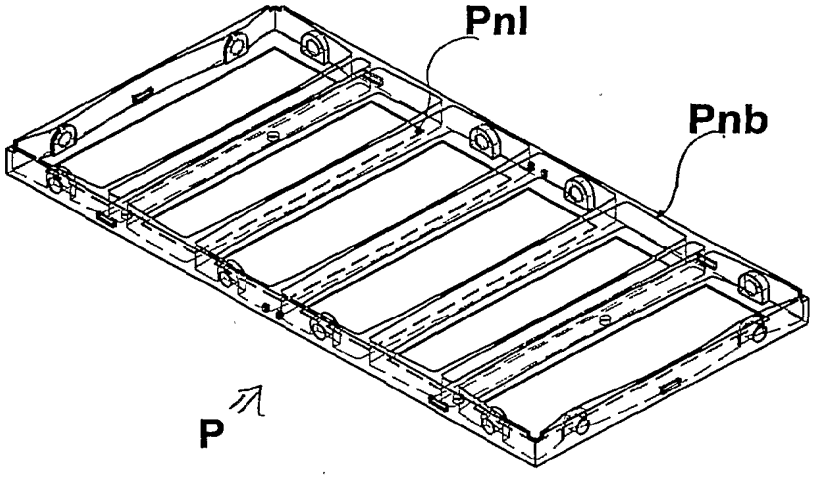
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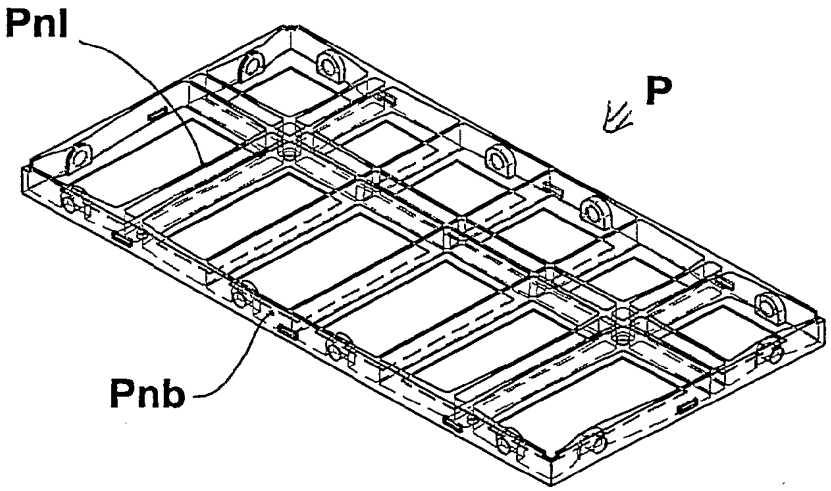
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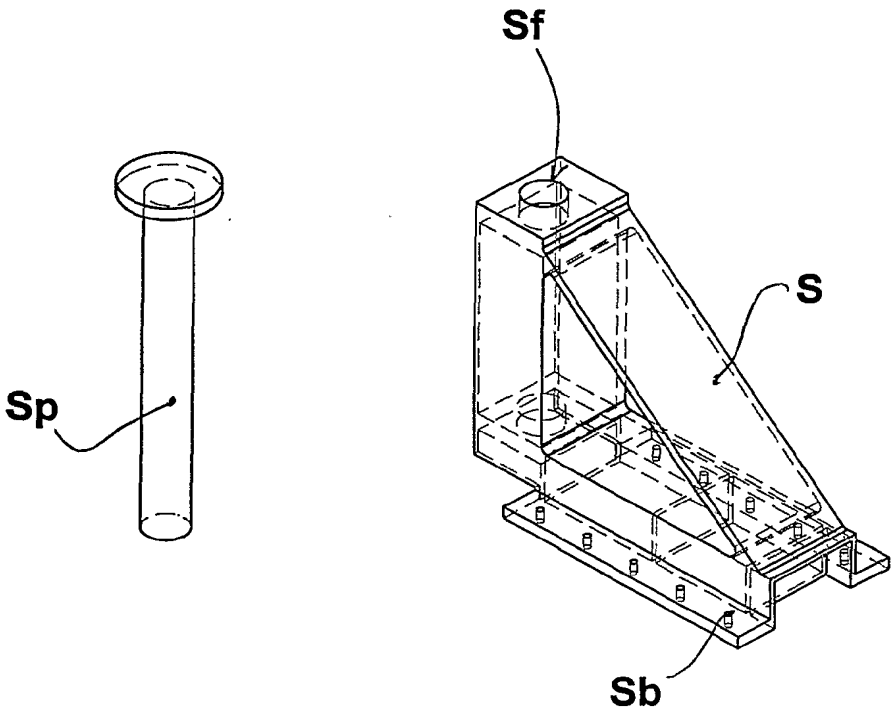
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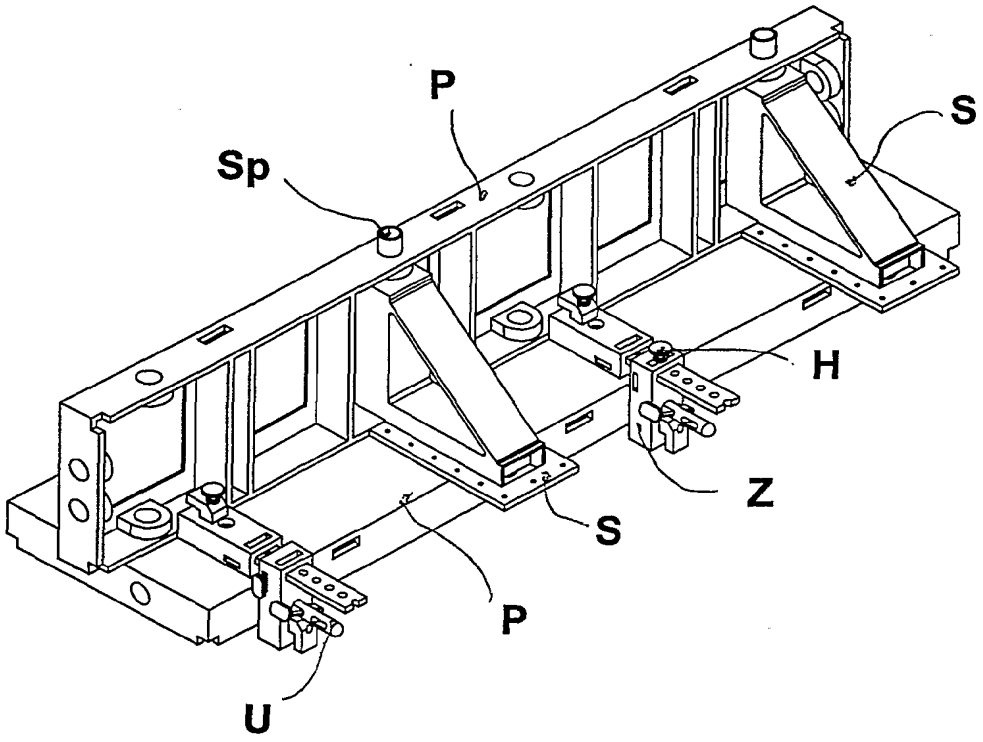
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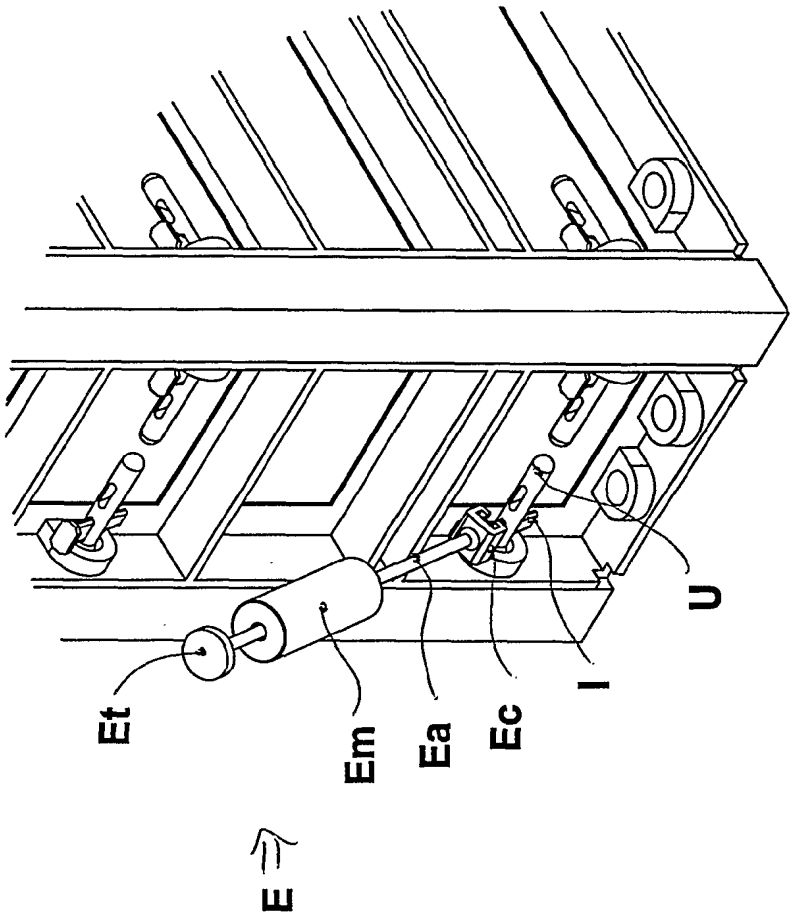
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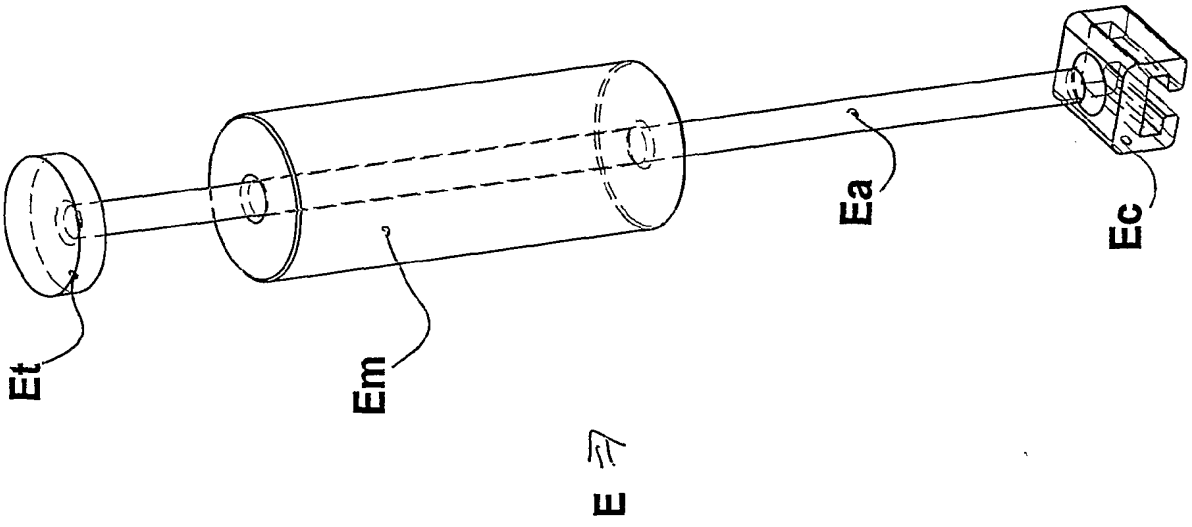
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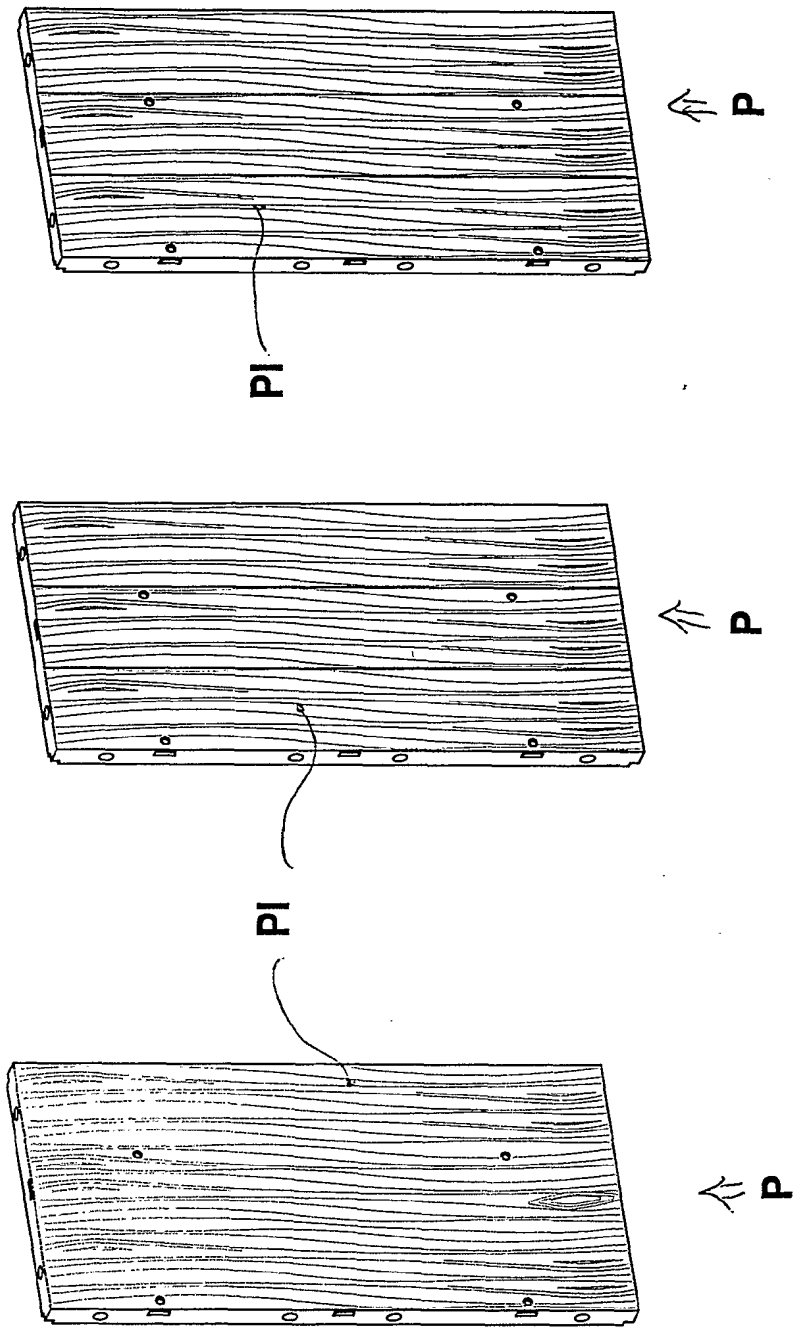
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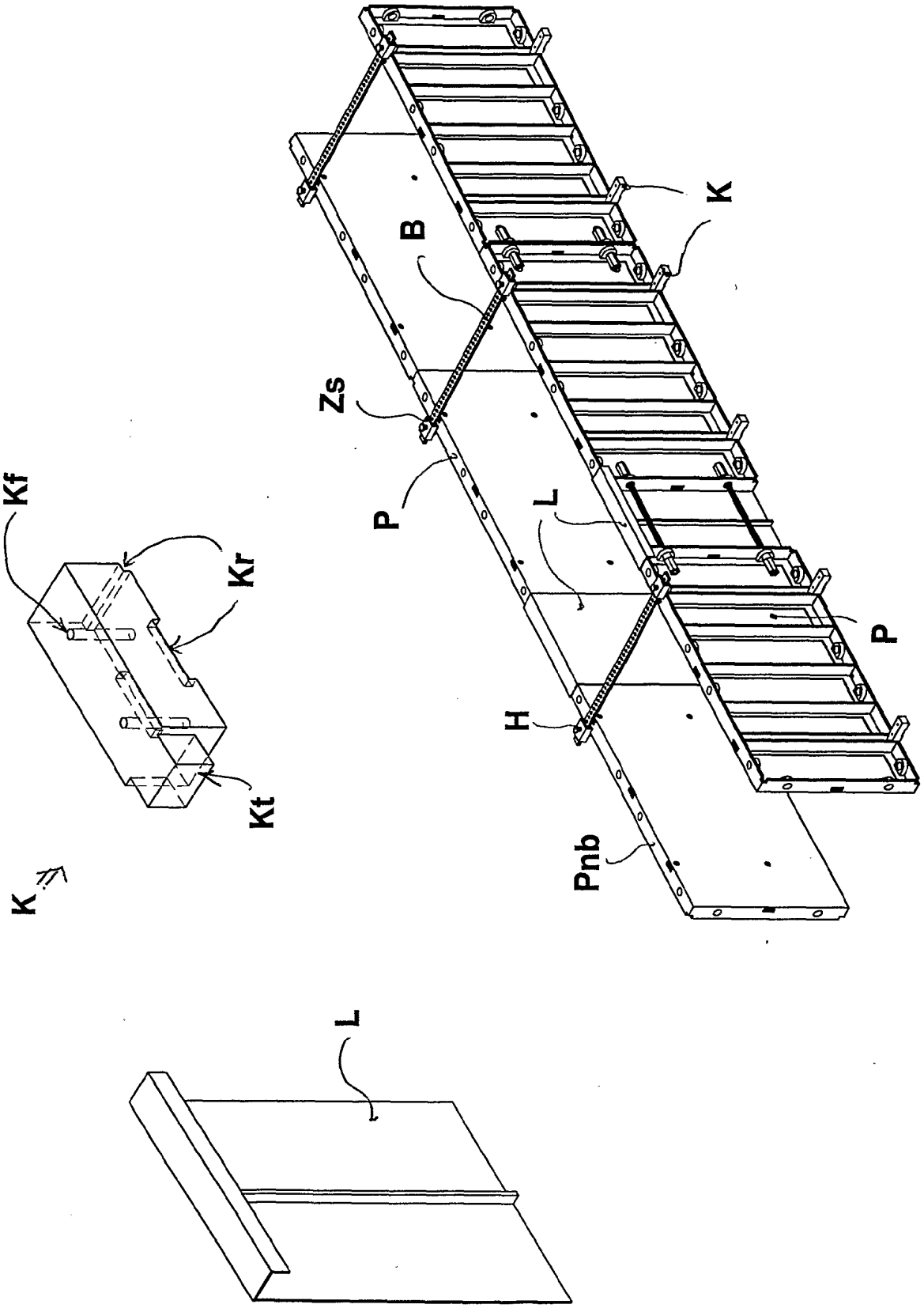
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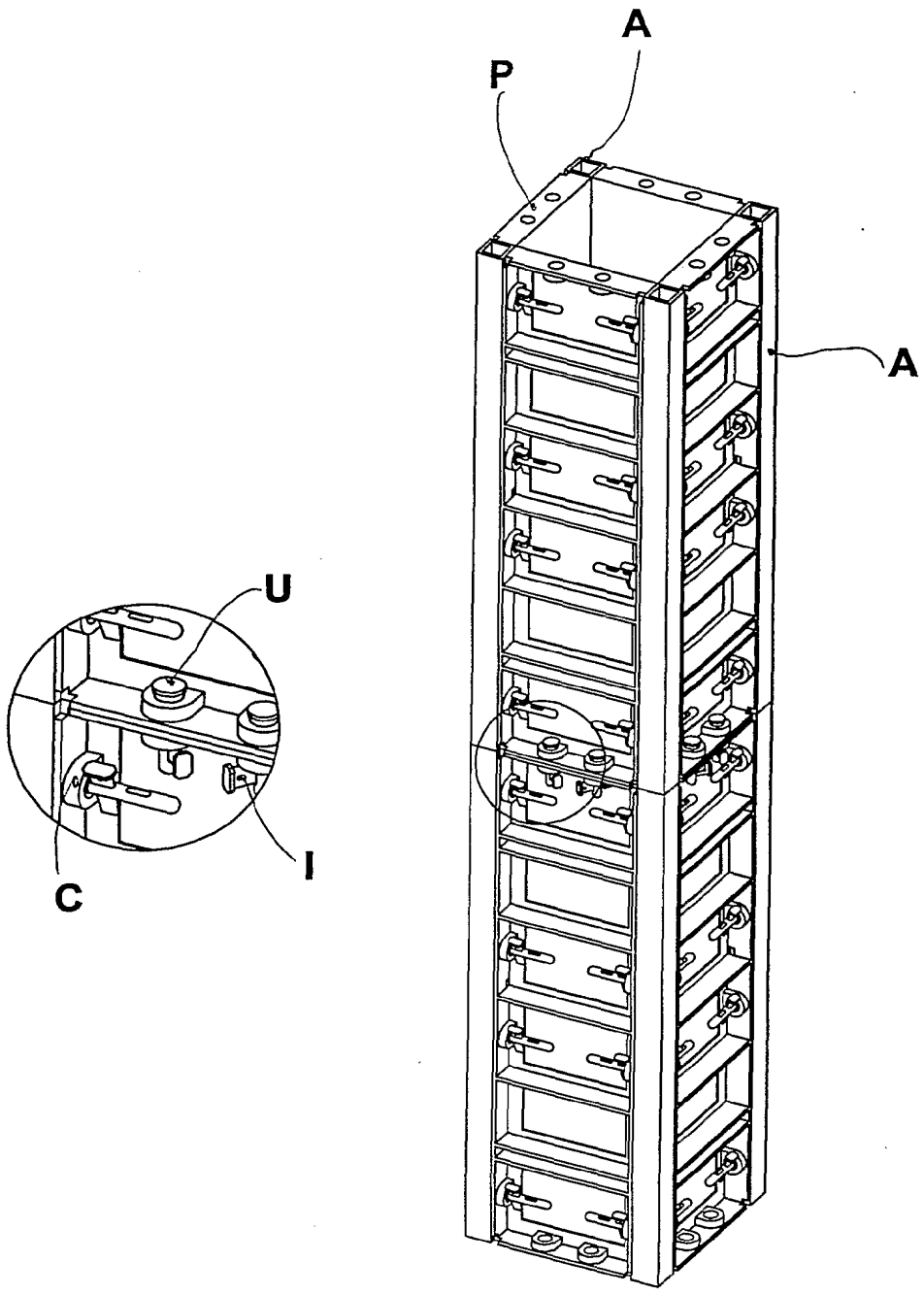
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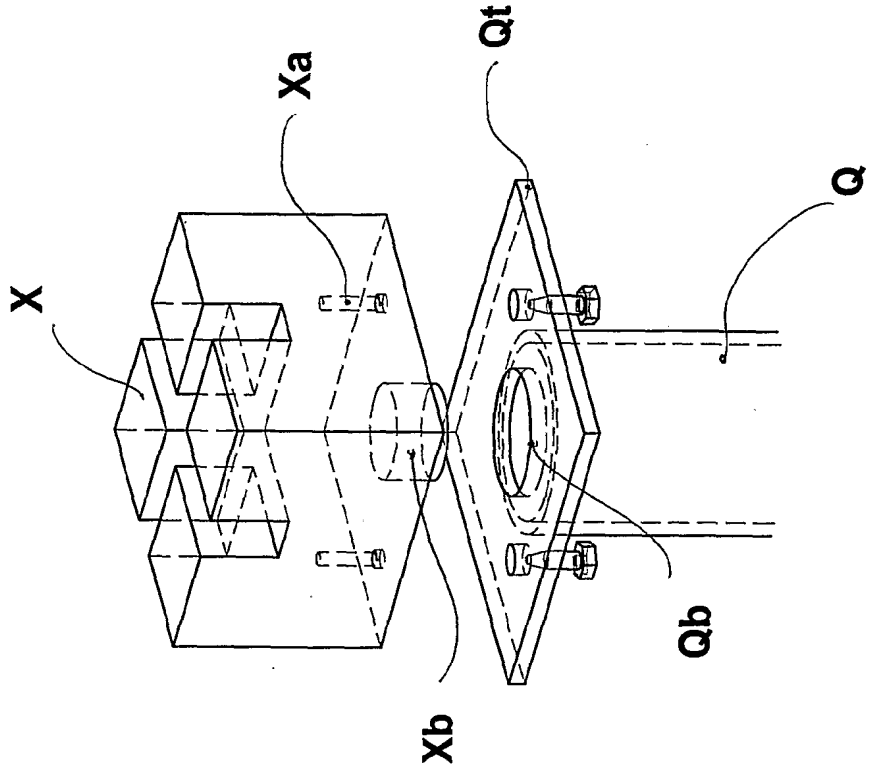
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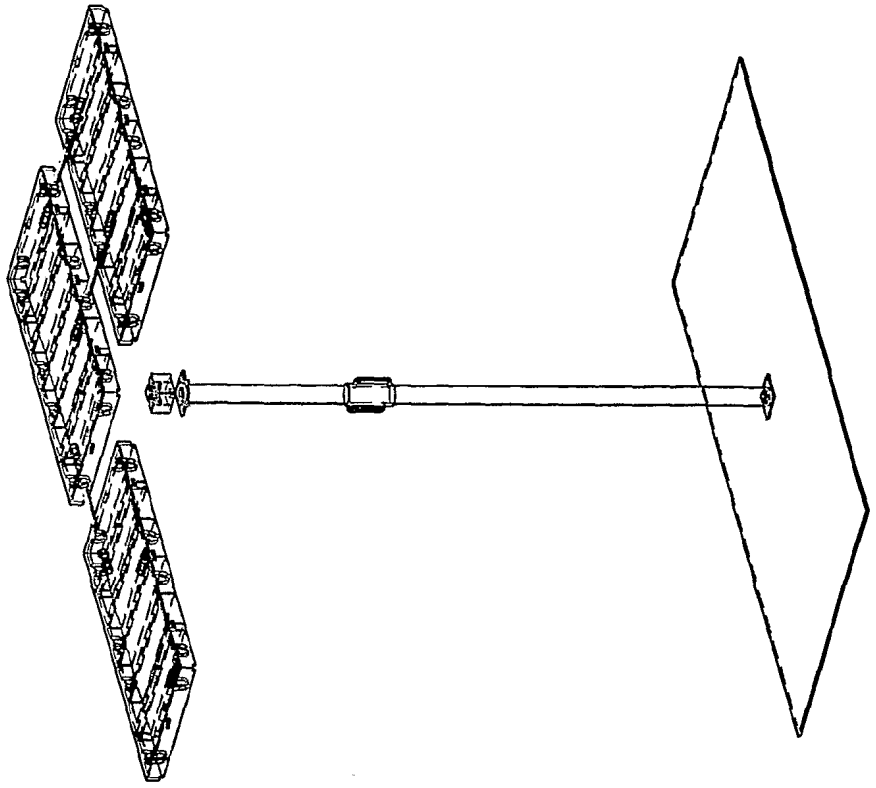

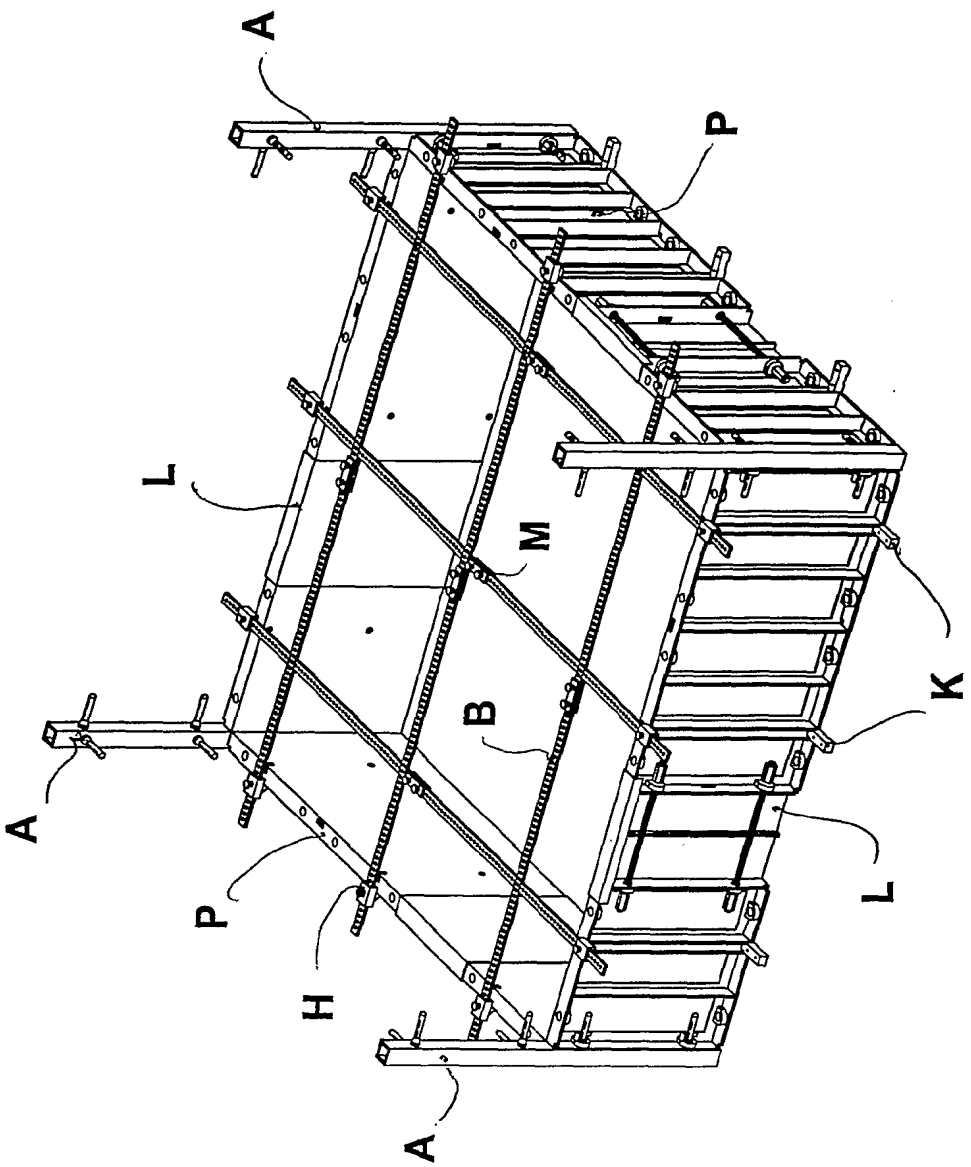
A
P
L
M
B
K
A
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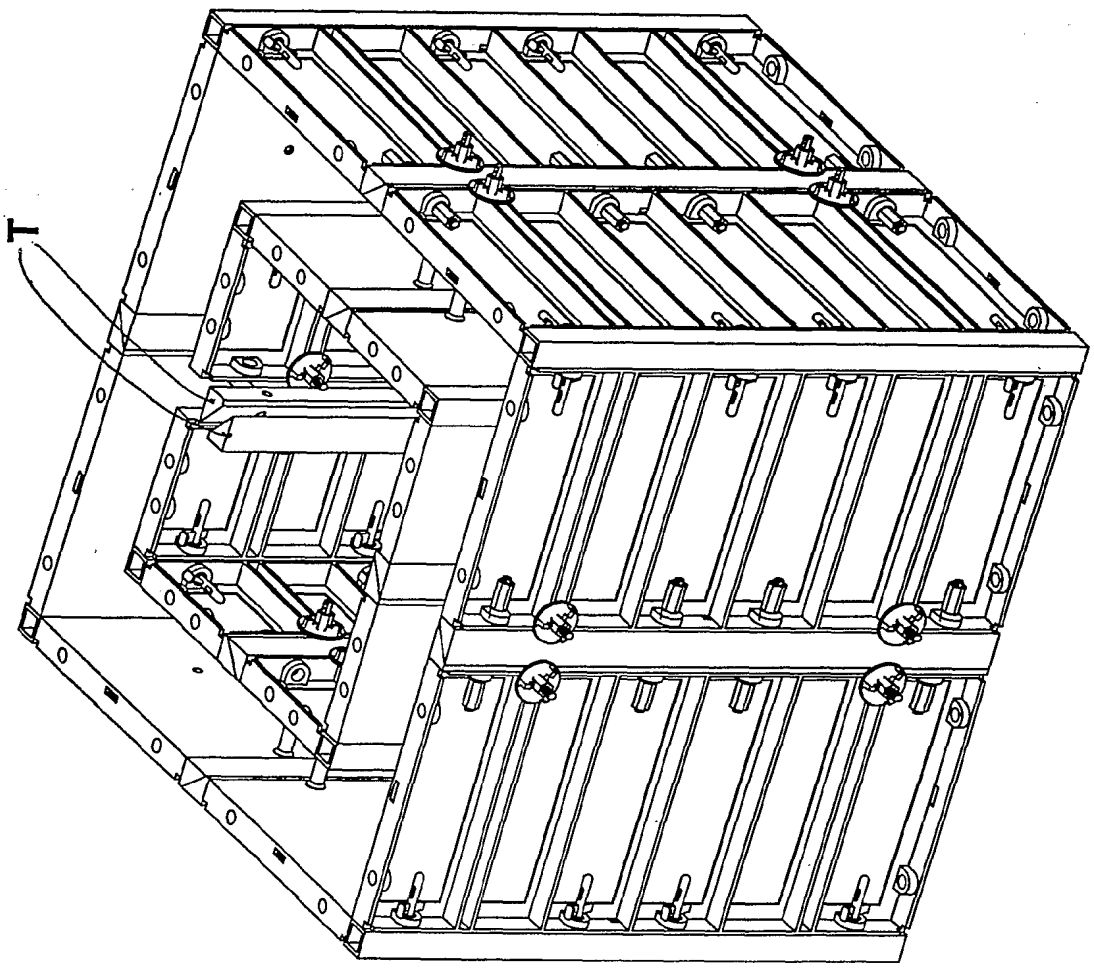
H
L
A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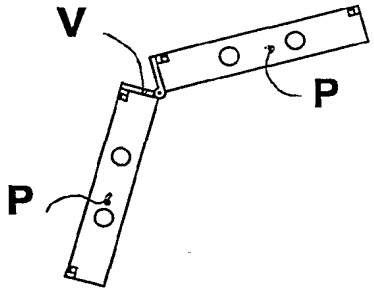
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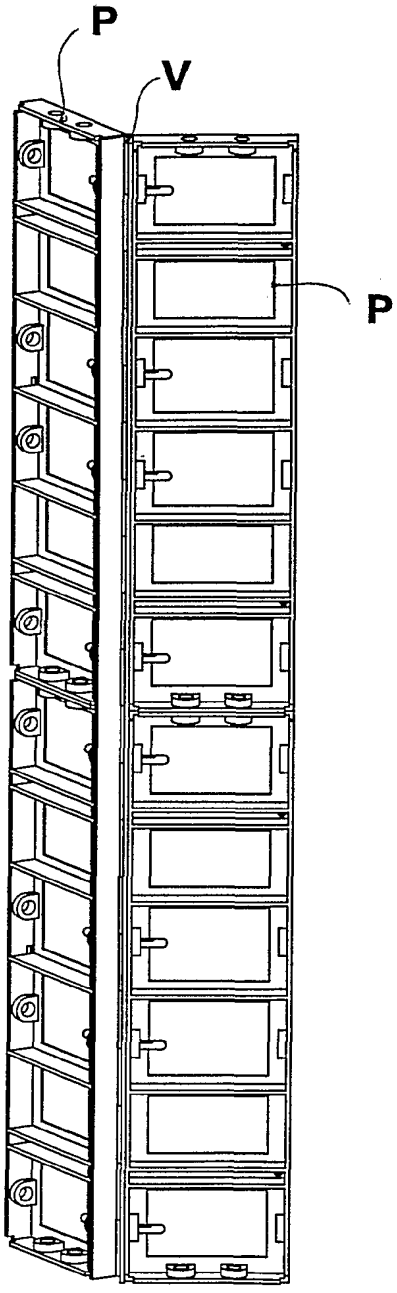
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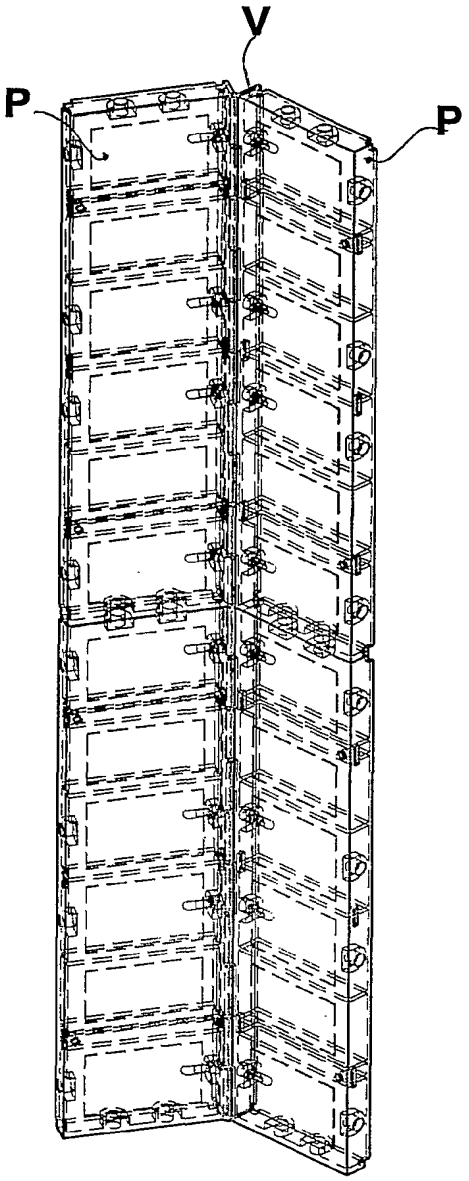
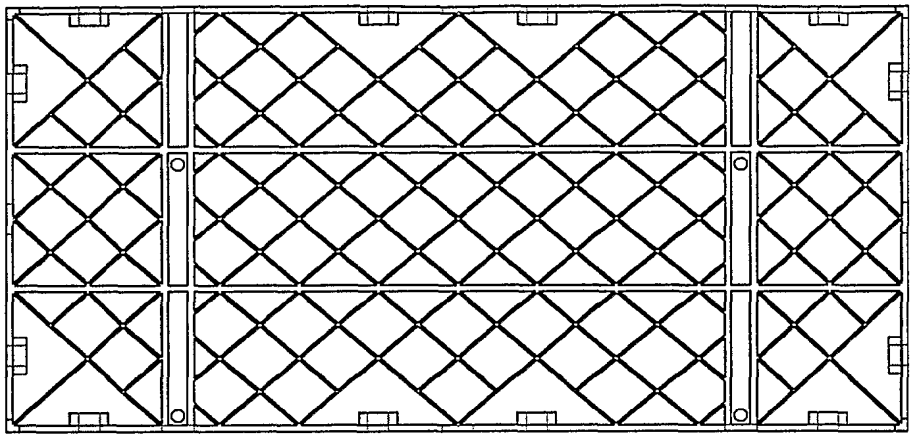
V
P


V
P
P

Pi



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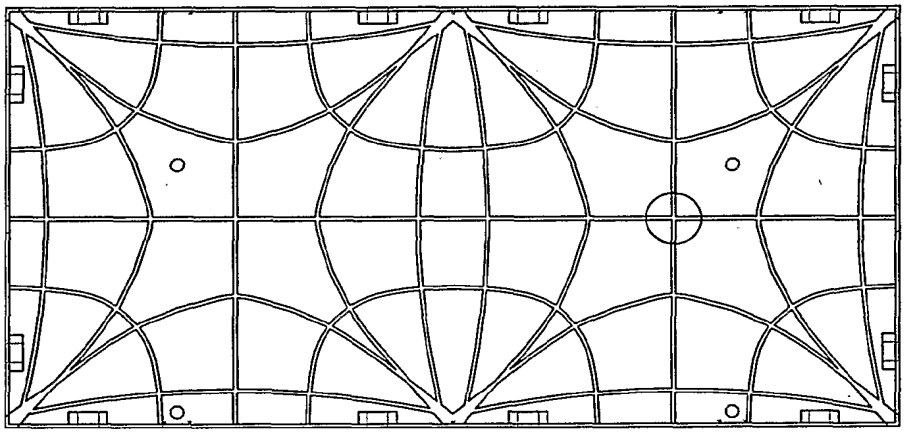
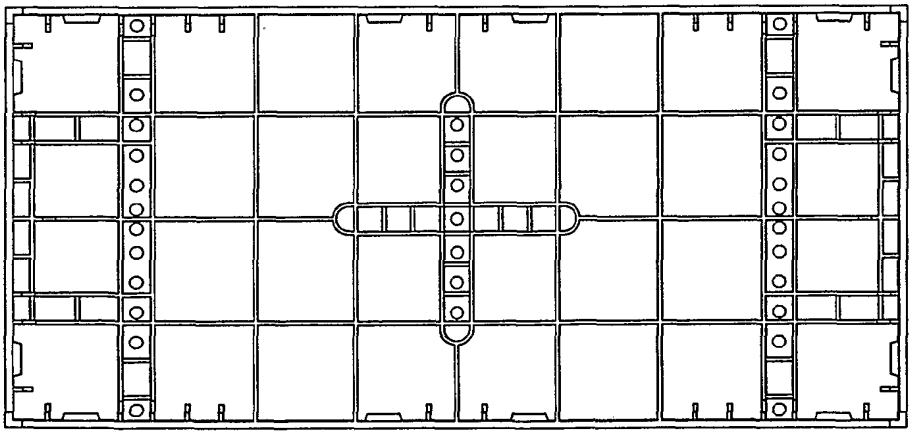
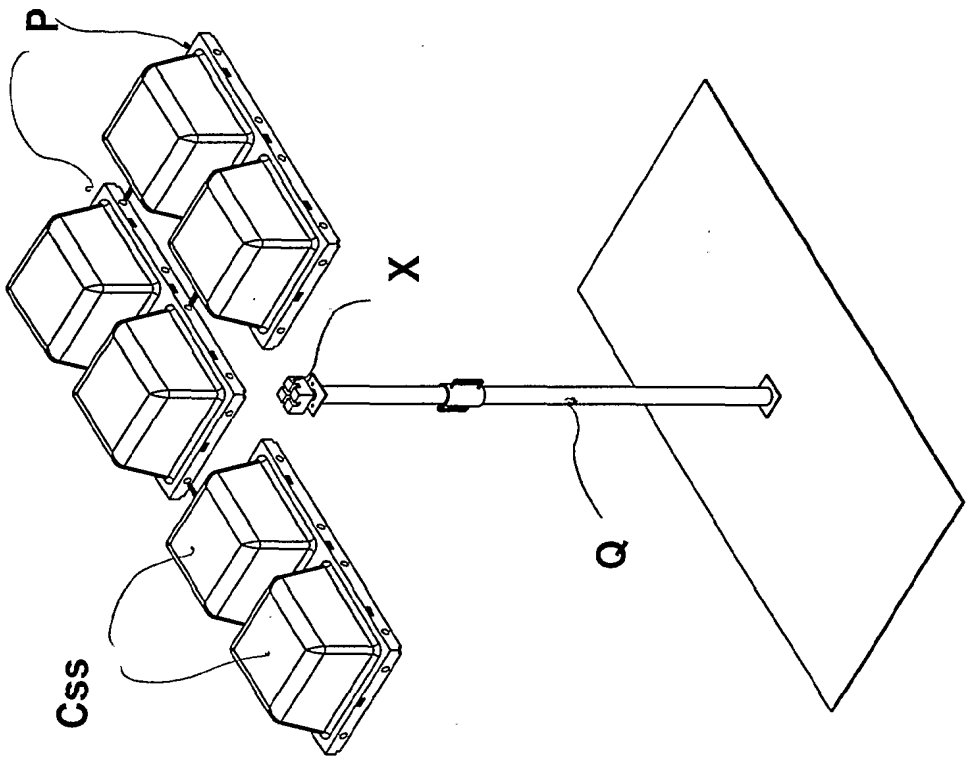


Piii

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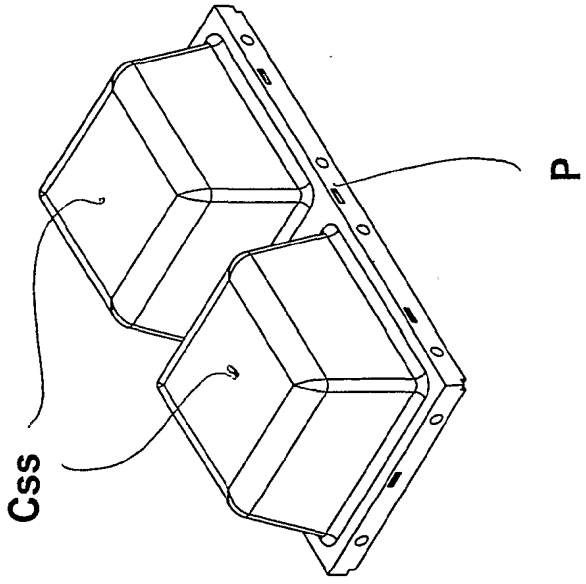
X
Q
Css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